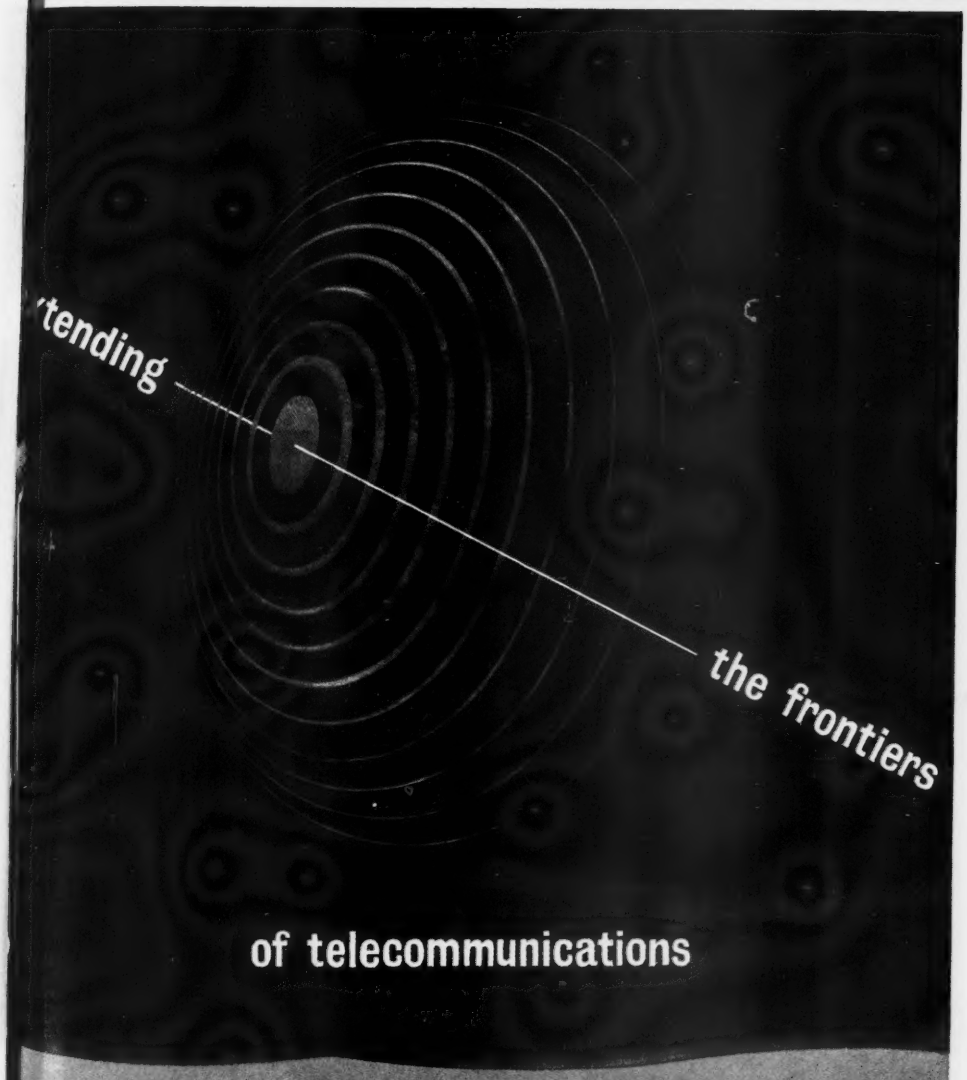
ELECTRICAL REVIEW



High standards of manufacture and testing, coupled with an extensive programme of continuous research and design, are the reasons for SIEMENS EDISWAN *being an important name in the world of telecommunications.*

SIEMENS EDISON SWAN LTD.
An A.E.I. Company

Telecommunications
Transmission Division,
Woolwich, London S.E. 18.

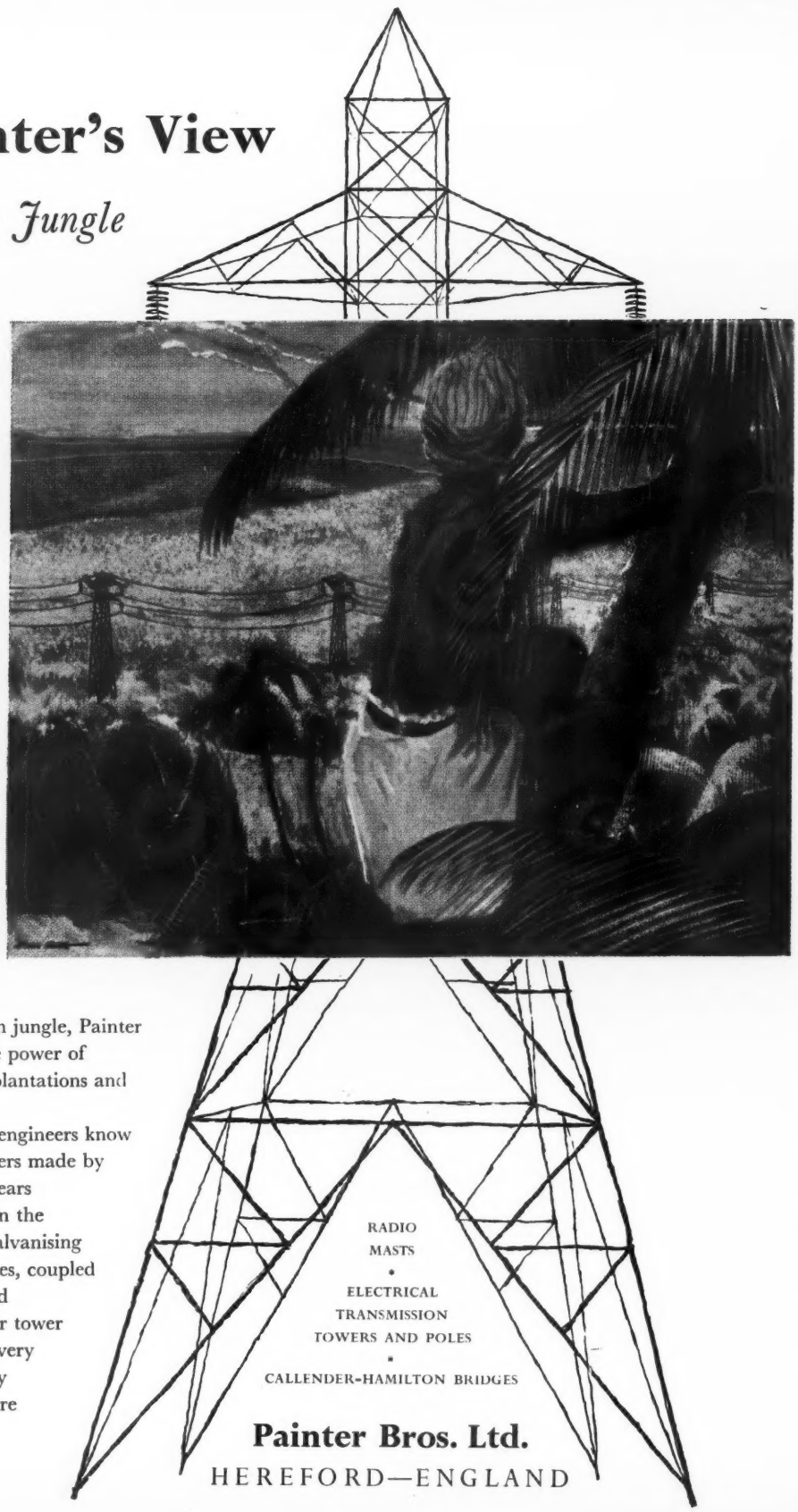
Telephone: Woolwich 2020
Telegrams: Sieswan Souphone London

BROAD BAND CARRIER TELEPHONE EQUIPMENT
VOICE FREQUENCY TELEGRAPH EQUIPMENT
VOICE FREQUENCY REPEATER EQUIPMENT
RADIO TELEPHONE TERMINAL EQUIPMENT
PROGRAMME CHANNEL EQUIPMENT
FIVE BAND PRIVACY EQUIPMENT
TRANSMISSION TEST GEAR
COMPONENTS AND OTHER EQUIPMENT

SIEMENS EDISWAN

The Painter's View

Giants in the Jungle



Striding over the Malayan jungle, Painter Brothers' towers carry the power of civilisation to the lonely plantations and the distant towns.

Throughout the world engineers know that they can rely on towers made by Painter Brothers, for 30 years of specialised experience in the fabrication and hot dip galvanising of mass-produced structures, coupled with the knowledge gained from the operation of their tower testing plant, go behind every ton produced—that is why Painter Brothers' towers are Towers of Strength.

RADIO MASTS

•

ELECTRICAL TRANSMISSION TOWERS AND POLES

•

CALLENDER-HAMILTON BRIDGES

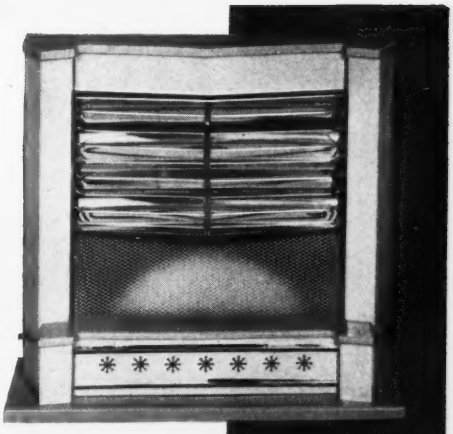
Painter Bros. Ltd.

HEREFORD—ENGLAND

WARMTH

around the House with

Heatrae



Heatrae products can be recommended with confidence as the best in heating equipment.

For house-warming, Heatrae offer a range of electrical air heaters and electric fires which are attractive in both appearance and economy.

Designed by specialists, the MAJESTIC—DANDY and PILOT meet the most stringent regulations and are of sound construction throughout.

For your customers' satisfaction, specify HEATRAE.

Write for a supply of Leaflets NOW !

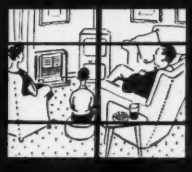
Established in 1920

HEATRAE LTD • NORWICH

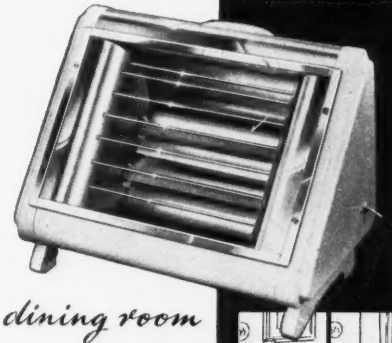
Pioneers in All-British Electric Heaters

Manufacturers of: Electric Water Heaters, Immersion Heaters, Oil Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flameproof Heating Apparatus, Electric Fires, Food Trolleys, Warming Plates, Air Heaters, etc.

In the lounge

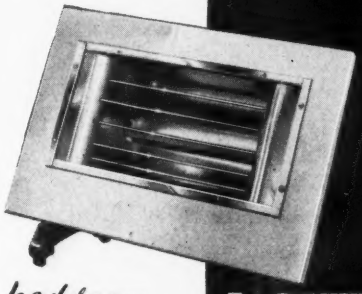


The MAJESTIC electric fire for comfortable warmth. Durable and so attractive.



In the dining room

The elegant DANDY radiates glowing warmth and combines efficiency with safety.



In the bedroom

The PILOT portable electric fire for cheerful warmth at low costs.

Don't spoil your ship!

In terms of cost the solder content of your products may be negligible. In terms of quality, dependability, *your* reputation, it is all-important. Why not act today? You've only to tell your buyer—"*Switch to Superspeed*"—and you can relax in the knowledge that all your risks are underwritten by the greatest name in soldering history.

ENTHOVEN *Superspeed*

incorporating Enthoven's unique 6-channel stellate core, is unchallenged as the most efficient cored solder wire for general assembly work on radio, television, electronic and telecommunication equipment. But remember, too, that there is an Enthoven solder product for every other engineering and manufacturing application. And Enthoven *always* means the best! If *you* use solder, please write today for the new edition of our brochure "*Enthoven Solder Products*"—or consult us, quite freely, on your particular problems.

Whenever soldering is discussed, *ENTHOVEN* enters the argument. It's a name that represents 150 years' experience in non-ferrous metals, and an incomparable record in research and development.

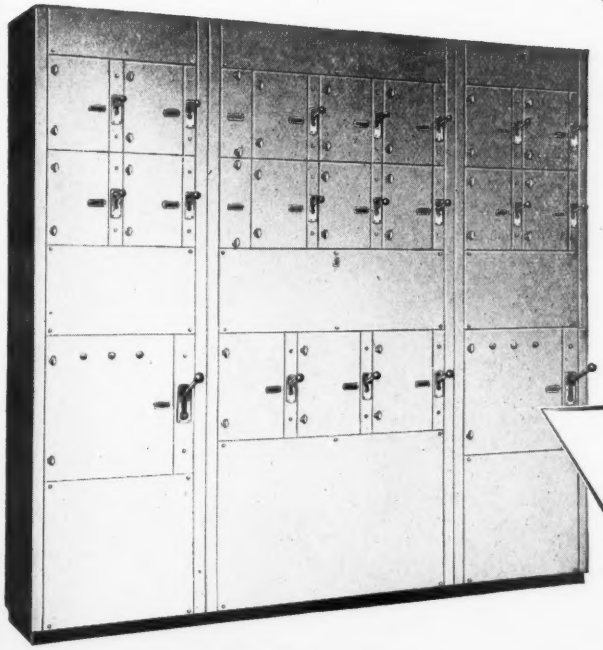
ENTHOVEN SOLDER PRODUCTS

ENTHOVEN SOLDERS LTD., DOMINION BUILDINGS, SOUTH PLACE, LONDON, E.C.2 MONarch 0391

You cannot buy better gear

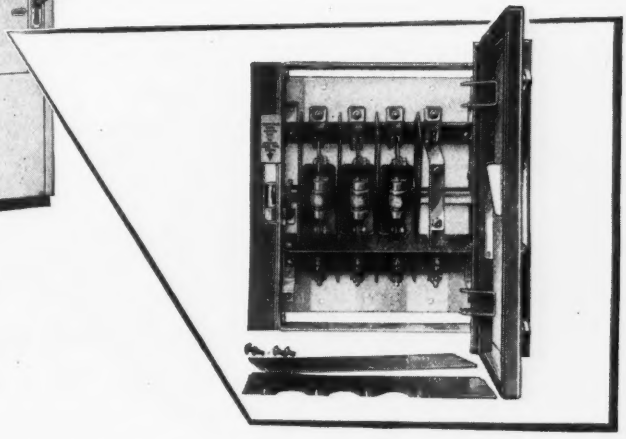
BILL MAJESTIC

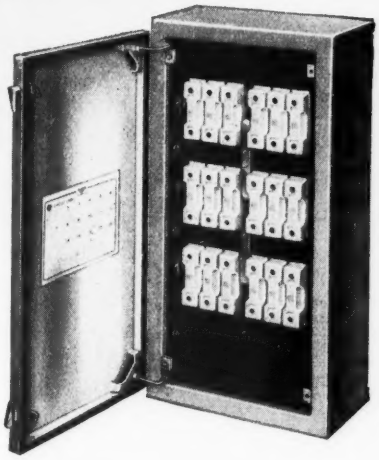
THE NEW LOOK IN SWITCHGEAR



BILL MAJESTIC HEAVY DUTY CUBICLE SWITCHBOARDS

- TOTALLY ENCLOSED, CLEAN MODERN STYLING.
- FLEXIBILITY OF LAY-OUTS TO SUIT SPECIFIC REQUIREMENTS OF CONSULTING ENGINEERS, ARCHITECTS AND CONTRACTORS.
- CAN BE SUPPLIED WITH BUILT-IN FUSEBOARDS AND FLUSH TYPE METERING.
- A RANGE OF FLUSH MOUNTING FUSE-SWITCHES FROM 30 TO 800 AMPERES CAN ALSO BE SUPPLIED AS SEPARATE UNITS.
- FULLY ILLUSTRATED IN PUBLICATION MCP 1057.





BILL MAJESTIC DISTRIBUTION BOARDS

- CLEAN AND ATTRACTIVE MODERN APPEARANCE.
- SIMPLIFIED MAINTENANCE.
- HEAVY DUTY BILL ARC DAMPING OR H.R.C. FUSES.
- FULLY ILLUSTRATED IN PUBLICATION MDB 1057.

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM·20

LONDON, S.W.1. A. W. ZELLEY. N. PAYNE. GILLINGHAM ST.

MIDLANDS. G.H. GARBETT. H. WILLIAMS. HEAD OFFICE.

NORTH MIDLANDS. C. G. BACHELOR. HEAD OFFICE.

CHELTENHAM C. GEARING. HIGH ST.

MANCHESTER, 3. H.H. POLLARD. J.H. RAMSAY. F.A. MAYOR. WOOD STREET.

BRISTOL, 3. W.L. WHITE. CHURCH LANE.

LEEDS, 7. N. SHARPLES. G. SUTTON. LOVELL RD.

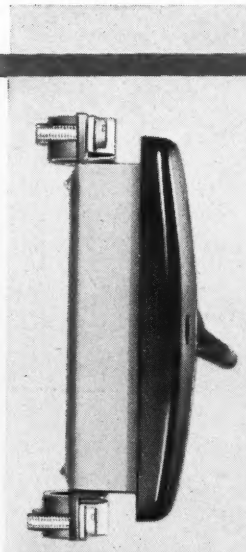
GATESHEAD, 8. S. J. DAVIS. PRINCE CONSORT RD.

GLASGOW. J. D. HARRIS. I. D. HARRIS. SAUCHIEHALL ST.

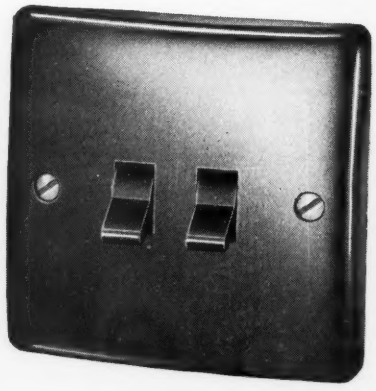
BELFAST J. BALLENTINE. BEDFORD ST.

There's wonderful value in the 'TAY' RANGE

Standard 3¼" square AC Plate Switch. One-gang pattern.



Side view of 'Tay' pattern switch showing shallow construction.



Standard 3¼" square AC Plate Switch. Two-gang pattern.

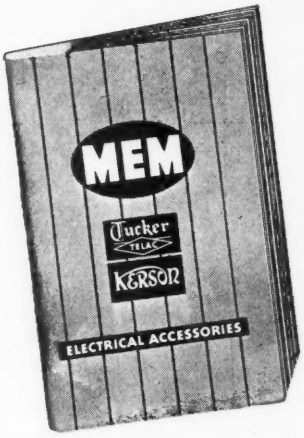
One-piece Flush Plate and Switch. The 'Tay' range of switches use one-piece construction. But all current carrying parts are mounted on high grade vitreous porcelain.

Plaster depth boxes. The 'Tay' range of flush plate switches are designed for use with extra-shallow plaster depth boxes. They are self-adjusting to varying plaster levels. This combined with easy wiring cuts installation costs.

AC only, solid silver contacts. The switch action is slow-break A.C. only, with solid silver contacts. The switch action is controllably silent.

Two-gang on standard 3¼" square plate. The two-gang 'Tay' plate switch has overall dimensions no greater than the standard 3¼" square plate one-gang switch.

The 'Tay' Range is ideal for the competitive domestic installation where low cost, easy installation and good appearance are desirable features.

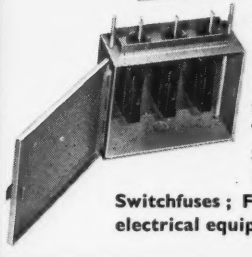


Send for your copy of the MEM-Tucker-Kerson Catalogue List No. 370—the most complete accessories catalogue in the trade.

Tucker TELAC MEM KERSON

MIDLAND ELECTRIC MANUFACTURING CO., LTD., TYSELEY, BIRMINGHAM, 11

Busbar trunking has been manufactured by The Power Centre Company for over quarter of a century. The picture shows part of a 12,000 feet installation supplying 3000 kVA in a large engineering works and forms an essential part of the electrical installation of this modern factory. It provides a flexible system of power distribution using the minimum of space, is neat, safe and simple to install. Our standard range covers 100 to 2,000 amps.



We also manufacture **Busbar Chambers; Switchboards; Cable Trunking; Cable Tap Systems; Busbar Rising Mains; Fuse Units; Switchfuses; Fuseboards and special electrical equipment.**

THE POWER CENTRE CO. LTD.

Lloyd Street, Wednesbury, Staffs

Phone: Wednesbury 0507 (PBX). Grams: "Powcent, Wednesbury"

LONDON OFFICE:
Wellington House, 125-130 Strand, W.C.2
Phone: TEMple Bar 1743

A TI Company

A Name

for Light

Elasta

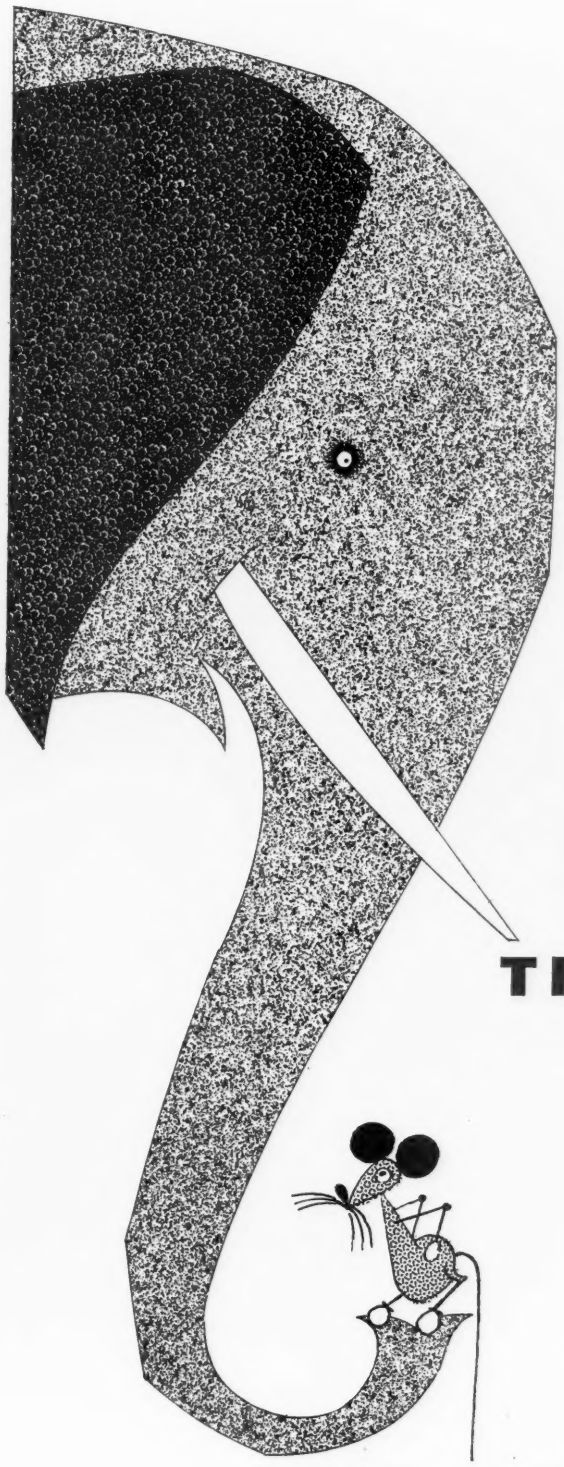
LAMPS

For nearly 50 years Elasta
has had a name for producing
lamps of high performance
and good quality.
Choose wisely — choose Elasta.

Tungsten Filament and Fluorescent

POPE'S ELECTRIC LAMP CO. LTD., *Head Office : 5 Earnshaw Street, New Oxford Street, London, W.C.2*

Branches : Manchester, Leeds, Leicester, Birmingham, Bristol, Belfast (Northern Ireland)



LARGE or small

HV. or **LV.**

it's agreed

DAVENSET

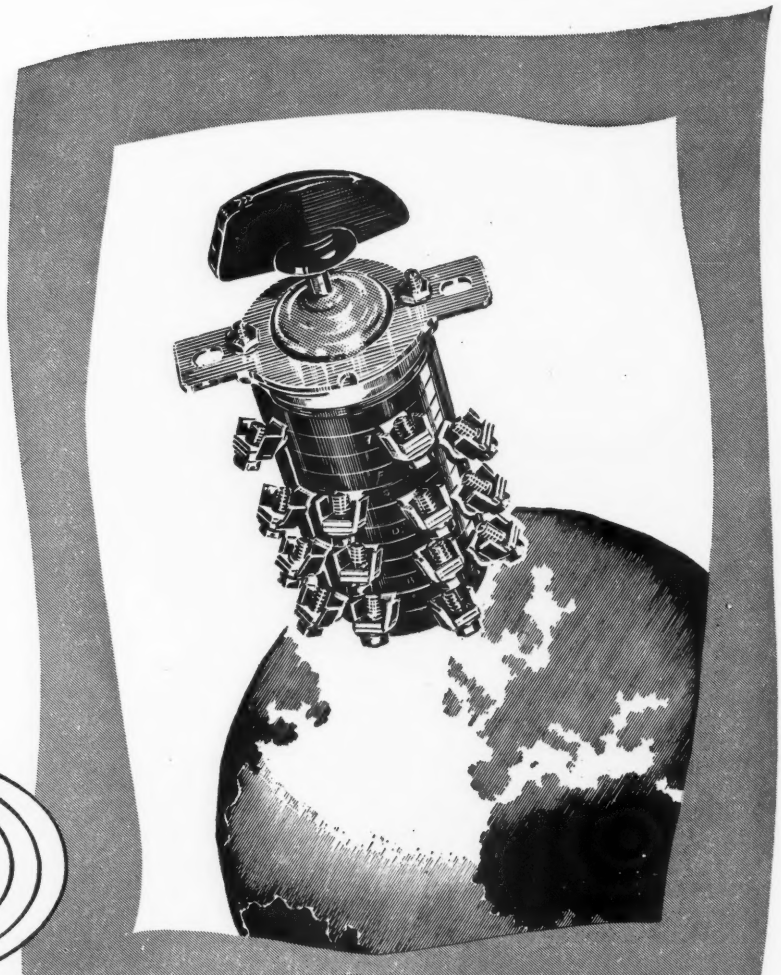
TRANSFORMERS

Of course!

PARTRIDGE WILSON & CO. LIMITED LEICESTER

Perfect Control by

SANTON



ROTARY SWITCHES *used all over the world!*

Santon Rotary Switches are the most convenient and reliable for

- sequence starting control for electric motors
- transformer tap changing
- 'charge' and 'discharge' battery switching
- economical remote control applications
- selector applications
- saving cost and space in control panels, etc.

COMPLETE RANGE OF SWITCHES FROM 5 TO 500 AMP. CAPACITY—30 YEARS' EXPERIENCE IN ROTARY SWITCH DESIGN

SANTON LIMITED · NEWPORT · MON

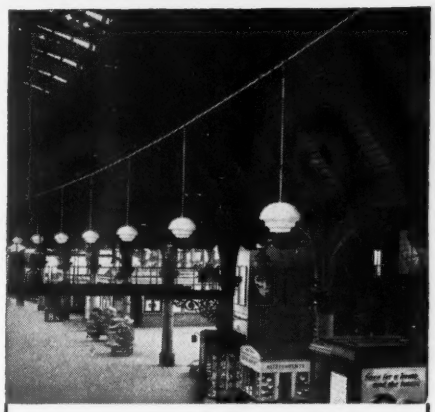
Telephone: Newport 71711

York station has new modern lighting with 'Perspex' fittings

THE RAILWAY station at York, one of the busiest in the North Eastern Region, has recently been relighted using cold cathode fluorescent lamps housed in fittings made from Opal 'Perspex' acrylic sheet.

Railway station fittings are exposed to the weather and to the highly corrosive fumes from engines and here the excellent resistance of 'Perspex' to chemical attack is of particular value.

Advantage is taken in these fittings of the good mechanical properties of 'Perspex' to secure an effective seal against the entry of dirt, so reducing maintenance to a minimum.



'Perspex' lighting fittings made by Ionlite Ltd., for British Railways, N.E. region, at York Station.

Applied 'Perspex' letters ensure permanence of lettering—another contribution to these trouble-free fittings for the future.

'PERSPEX' **Today—for tomorrow**

'Perspex' is the registered trade mark for the acrylic sheet made by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1.

FP.57

Reliable Witnesses . . .

The following are a few of the notable Companies and Organisations who are users of Gents' equipment — proof of the international acceptance of the reliability of our products. Gents' have a reputation throughout the world for fine Electrical Equipment — a reputation based on quality, good workmanship and accuracy.
You have the same guarantee when you specify Gents' Electrical Products.

Fire Alarm Systems

London Transport Executive Main Works, Aldenham
International Harvester Co. Ltd., Doncaster
BOAC London Airport
Singapore Airport
Hotel Leofric, Coventry
Waikiri Hospital, Dunedin, N.Z.
British Military Hospital, Dhekélia, Cyprus

Controlled Electric Clock Systems

British Broadcasting Corporation (over 70 installations)
House of Commons, London
British Thomson-Houston Factory, Larne, and others
Bank of England Printing Works, Debden
Stella North and South Power Stations and others throughout the world
Kidbrooke Comprehensive High School
Most Main Line Railway Stations throughout Britain
Broadcasting Stations throughout the World

Liquid Level Indicating and Recording Equipment

Aba Water Supply, Nigeria
Kuwait Water Scheme, Persian Gulf
Tasmanian Hydro Electric Commission
Trinidad and Tobago Chimborazo Scheme
River Boards, RDC ,UDC and similar Water Undertakings throughout Britain

Other products include:—Mains Operated Clocks, Tower Clocks, Striking and Chiming Equipment, Watchman's Tell-Tale Recorders, Staff Locators, Luminous Signalling Systems, Bells and Indicators, Workmen's Time Recorders.
Free illustrated Catalogues are available on request.

GENTS' OF LEICESTER **ELECTRICAL PRODUCTS**

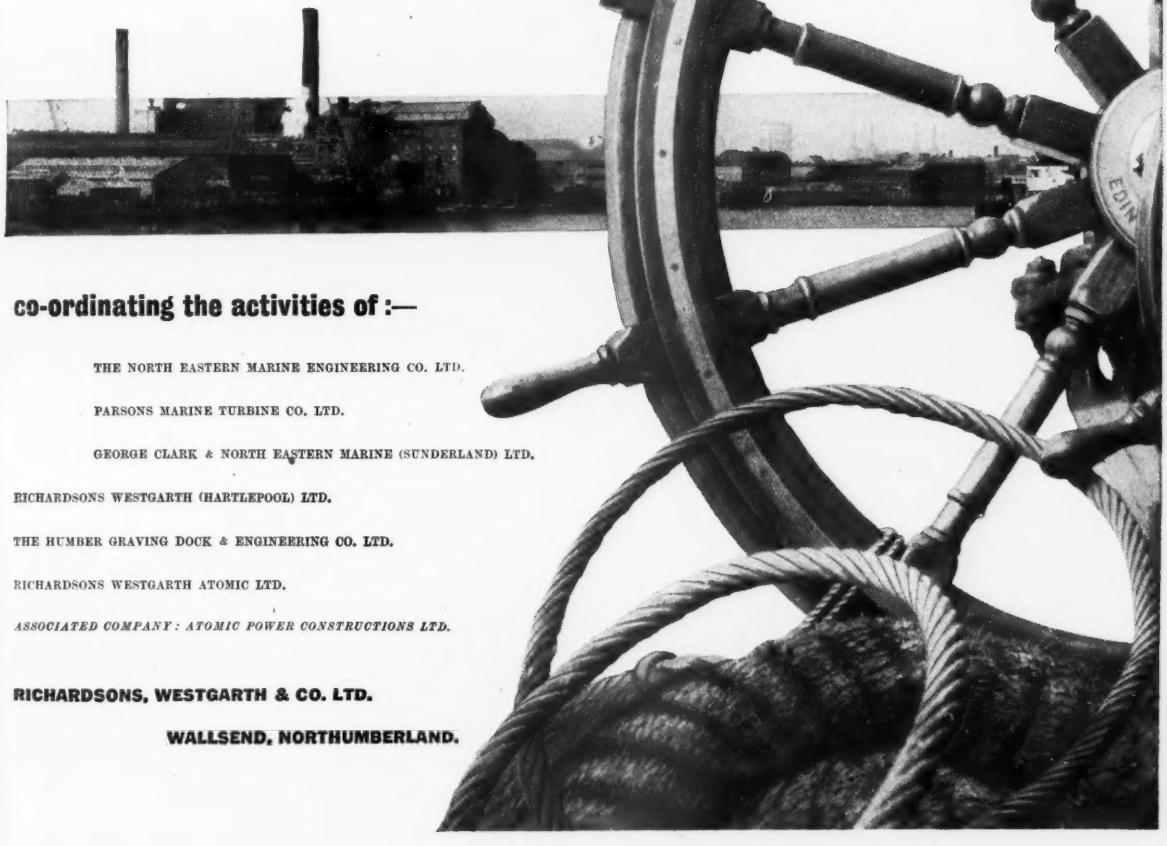
GENT & COMPANY LIMITED . FARADAY WORKS . LEICESTER
London Office & Showrooms: 47 Victoria Street, London S.W.1.
ALSO AT: BIRMINGHAM · BRISTOL · EDINBURGH · GLASGOW AND NEWCASTLE
AGENTS IN OVER 50 COUNTRIES OVERSEAS

The Richardsons Westgarth Group

have . . . built some of the most efficient steam turbines and boilers ever put into a British or any other Generating Station, be it National or Industrial.

. . . built the blowing equipment installed in many of the Steel Works throughout the Country.

. . . built ships' engines totalling a greater horsepower than any other manufacturer in the United Kingdom.



co-ordinating the activities of :—

THE NORTH EASTERN MARINE ENGINEERING CO. LTD.

PARSONS MARINE TURBINE CO. LTD.

GEORGE CLARK & NORTH EASTERN MARINE (SUNDERLAND) LTD.

RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.

THE HUMBER GRAVING DOCK & ENGINEERING CO. LTD.

RICHARDSONS WESTGARTH ATOMIC LTD.

ASSOCIATED COMPANY: ATOMIC POWER CONSTRUCTIONS LTD.

RICHARDSONS, WESTGARTH & CO. LTD.

WALLSEND, NORTHUMBERLAND.

an unrivalled service in special alloy cast irons

Write for a free copy of the brochure "Ferranti Quality Castings"

The accuracy which distinguishes Ferranti products in the electrical engineering field has been carried also into their foundry products. The Ferranti Foundry offers an unrivalled service to all industries in the supply of castings, particularly in the field of special alloy cast irons which include

- ★ **S. G. Iron**
- ★ **Nomag**
- ★ **NOduMAG**
- ★ **Ni-Resist**
- ★ **Ni-Hard**

The Ferranti service also covers accurate thin wall Grey Iron repetition castings backed by over 50 years' Foundry experience.

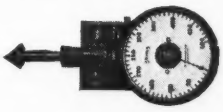
FERRANTI

Quality Castings

FERRANTI

FERRANTI LTD., HOLLINWOOD, LANCASHIRE. *London Office:* KERN HOUSE, KINGSWAY, LONDON, W.C.2

indication



HAND TACHOMETERS 0-50,000 R.P.M.

MAGNETIC TACHOMETERS
1¾" TO 12" DIAMETER

ELECTRIC TACHOMETERS
4" TO 12" DIAMETER

D.C. WATERTIGHT SPEED INDICATORS

THERMOMETERS AND PRESSURE GAUGES

ODUCTION TIMERS AND STOP WATCHES

MEASURING INDICATORS

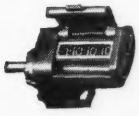
counting

A.C. SYNCHRONOUS
HOURS COUNTERS

LIFT
MILEAGE COUNTERS

ROTARY AND RATCHET
UNIT COUNTERS

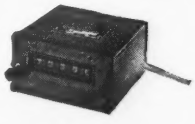
D.C. ENGINE HOUR METERS



ENGINE
SERVICE COUNTERS

LOOM
REVOLUTION COUNTERS

SINGLE, TWO AND THREE
SHIFT PICK COUNTERS



IMPULSE COUNTERS

recording

RECORDERS FOR INDICATING R.P.M. AND
"DESYNN" FUNCTIONS

SMITHS

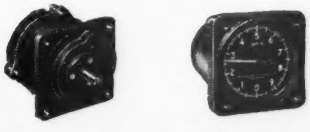
The service offered to Industry by SMITHS—Britain's largest manufacturers of instruments—is the most comprehensive of its kind.
The extent of our wide range of instruments is limited only by the present demands of Industry. This range is constantly being increased as manufacturers bring us new problems concerning the accurate measurement of speed, time, distance, quantity, pressure, vacuum, displacement, or temperature—have you such a problem?

the unrivalled service in industrial instrumentation

General leaflet AY 640 sent on request.

SMITHS service to Industry places at your disposal an unrivalled experience, the most extensive facilities for research and testing and a reputation for sound design and reliable performance.

INDUSTRIAL "DESYNN"



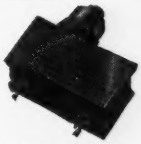
REMOTE INDICATION OF ANGULAR POSITION, FLUID LEVEL, FORCE, LINEAR POSITION, DIFFERENTIAL PRESSURE AND PRESSURE

MARINE "DESYNN"

THERMOSTATS

"PETRO-FLEX"
FLEXIBLE TUBING

HAND MEASURING
WHEELS



HERMETICALLY SEALED
LIMIT SWITCHES

SMITHS

SMITHS INDUSTRIAL INSTRUMENTS LTD.,

Chronos Works, North Circular Road, London, N.W.2 *Telephone: GLAdstone 1136*

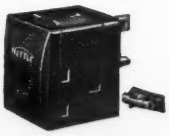
Scottish Sales Office: 123-145 North Street, Glasgow, C.3. *Northern Sales Office:* York House, 12 York Street, Manchester

THE INDUSTRIAL INSTRUMENT DIVISION OF S. SMITH & SONS (ENGLAND) LTD.

Greetings

To our many friends in the Trade we extend Cordial good wishes for Christmas and we look forward to a continuation of mutual prosperity in the coming Year

NETTLE
ACCESSORIES
Ltd.



HARPER ROAD • WYTHENSHAWE • MANCHESTER 22

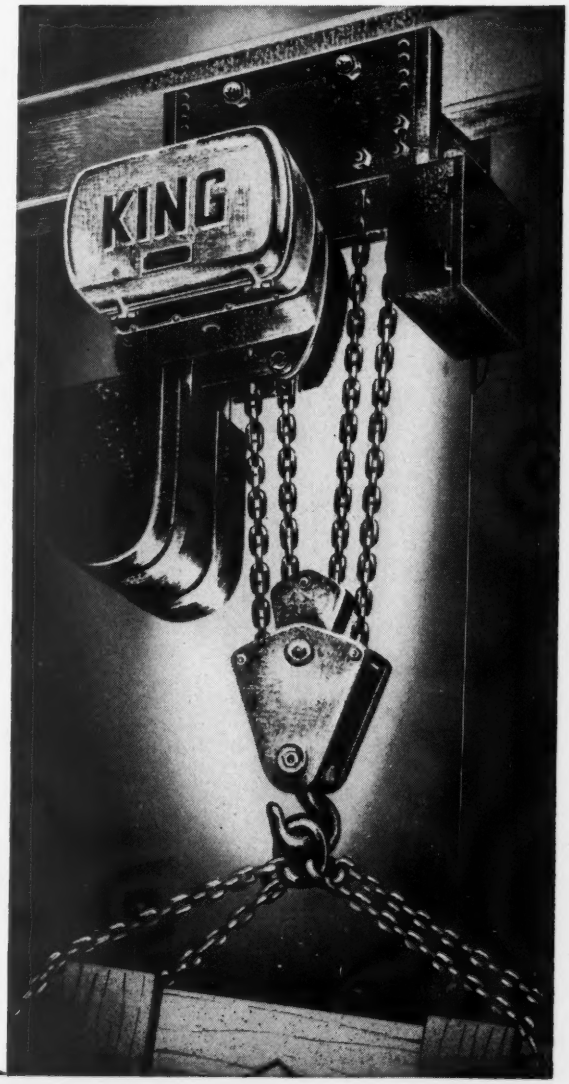
Member of the Aerialite group

There's a KING PULLEY BLOCK for every load

The KING range of electrically powered pulley blocks starts with the Matom model—an armful of ingenuity which lifts 200 lb. at 50 ft. per minute —and ends with the mighty Mammoth which has a capacity of up to 10 tons. *(Both are illustrated here.)* In between is the most comprehensive range of blocks in the country. All types of suspension methods and current supplies are provided for. You will find we have special equipment to handle the most unusual loads. Every KING pulley block is individually tested. Chains and materials are well in excess of statutory requirements. Design is constantly being modified in the light of our Development Department's findings. Operation is by pendent push control from hoist, or remote control. Patented safety features are incorporated and prices are highly competitive.

Why not write for our catalogue? Full details need far more space than is available to us here. We also manufacture manually operated pulley blocks.

CREEP SPEED MODELS NOW AVAILABLE



KING
REGISTERED TRADE MARK

ELECTRIC PULLEY BLOCKS

Covered by British and Foreign Patents

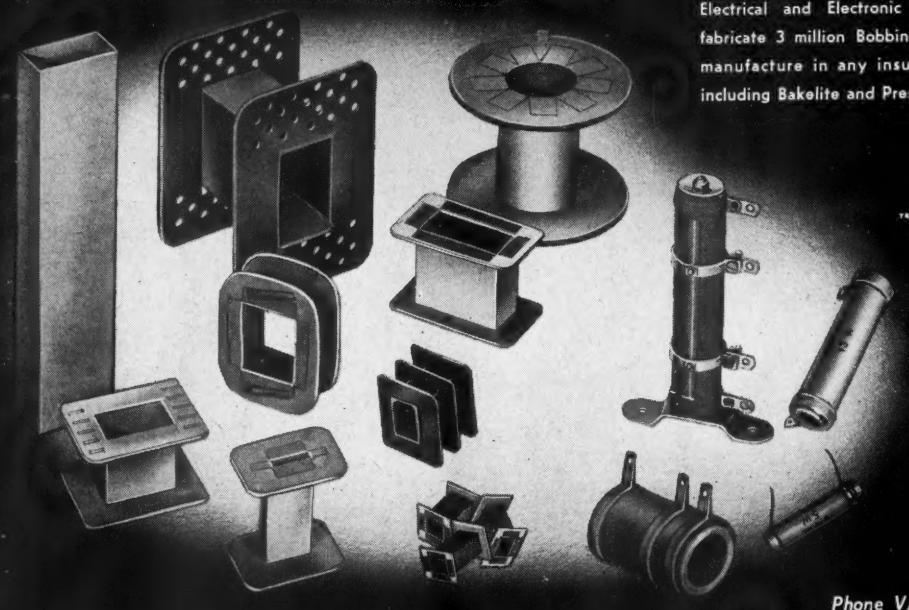
Write for Catalogue PB.7 to

GEO. W. KING LTD., ARGYLE WORKS, STEVENAGE, HERTS. TEL: STEVENAGE 440

Specialists in insulating **FORMERS, BOBBINS,** *and wire wound* **RESISTORS**

25 Years experience of manufacturing Bobbins and Formers enables us to satisfy the most exacting requirements of the Electrical and Electronic Industries. We fabricate 3 million Bobbins each year and manufacture in any insulating materials including Bakelite and Presspahn.

TRADE TUSKITE MARK
A.I.D APPROVED



Phone VANGE 2167/8

ARMAND TAYLOR & CO. LTD. TUSKITE WORKS, MARSH ROAD, PITSEA, ESSEX.

HEAVY DUTY

PATENT 'T.A.'

This patent bayonet holder will operate continuously at 10 amps with safety, and will reduce maintenance charges. Specially designed for Railway conditions.

LAMPHOLDER

SPERRYN

SPERRYN & CO. LTD., MOORSOM ST., BIRMINGHAM 6

Telephone: ASTon Cross 4011 (5 lines)

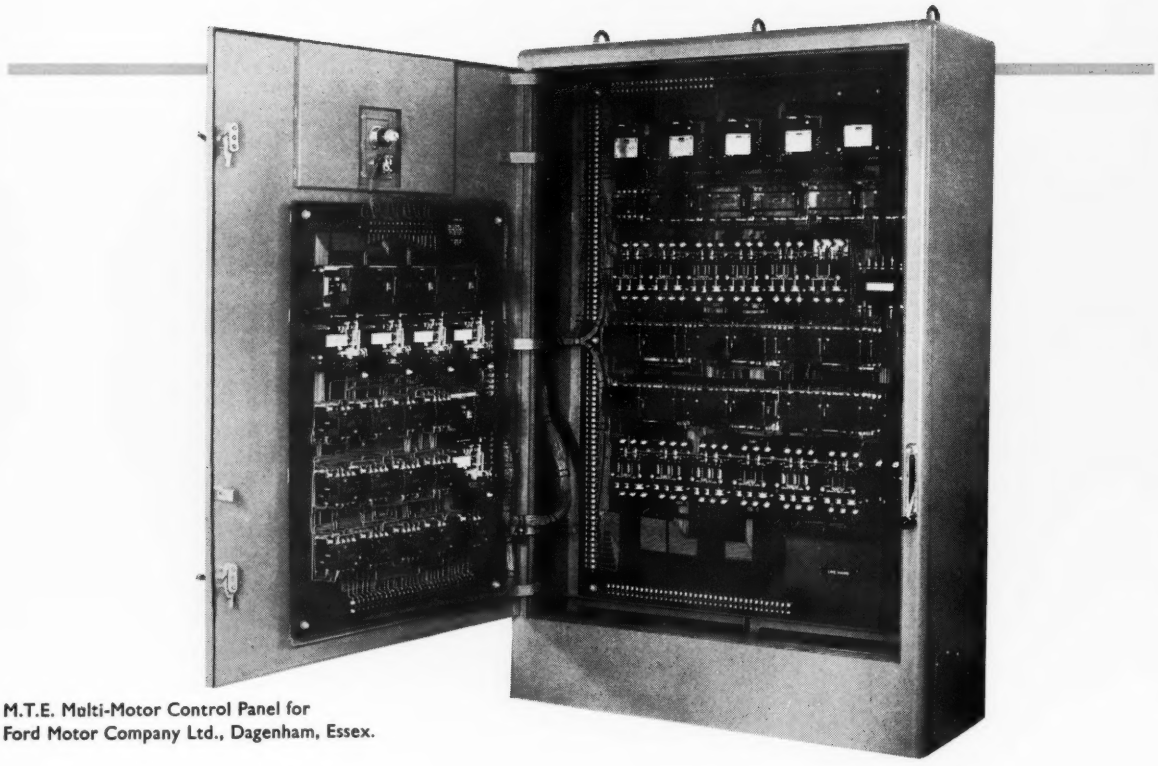
LONDON ADDRESS: 23 GREAT SUFFOLK ST. LONDON, S.E.1. TELEPHONE: WATERLOO 6418

Here's a load of Joy
WITH BEST WISHES FOR CHRISTMAS AND THE NEW YEAR
Jackson
THE JACKSON ELECTRIC STOVE COMPANY LIMITED · LUTON AND LONDON

M.T.E

Progress Range Control Gear as used by

Ford Motor Company Ltd.



M.T.E. Multi-Motor Control Panel for
Ford Motor Company Ltd., Dagenham, Essex.

FORD MOTOR COMPANY LTD., DAGENHAM, ESSEX, is one of the many famous names in British industry making increasing use of M.T.E. "Progress" contactors, relays and other components.

The incorporation of M.T.E. components speeds up construction and holds costs down to competitive levels, whilst their versatility renders them suitable for a wide range of industrial applications.

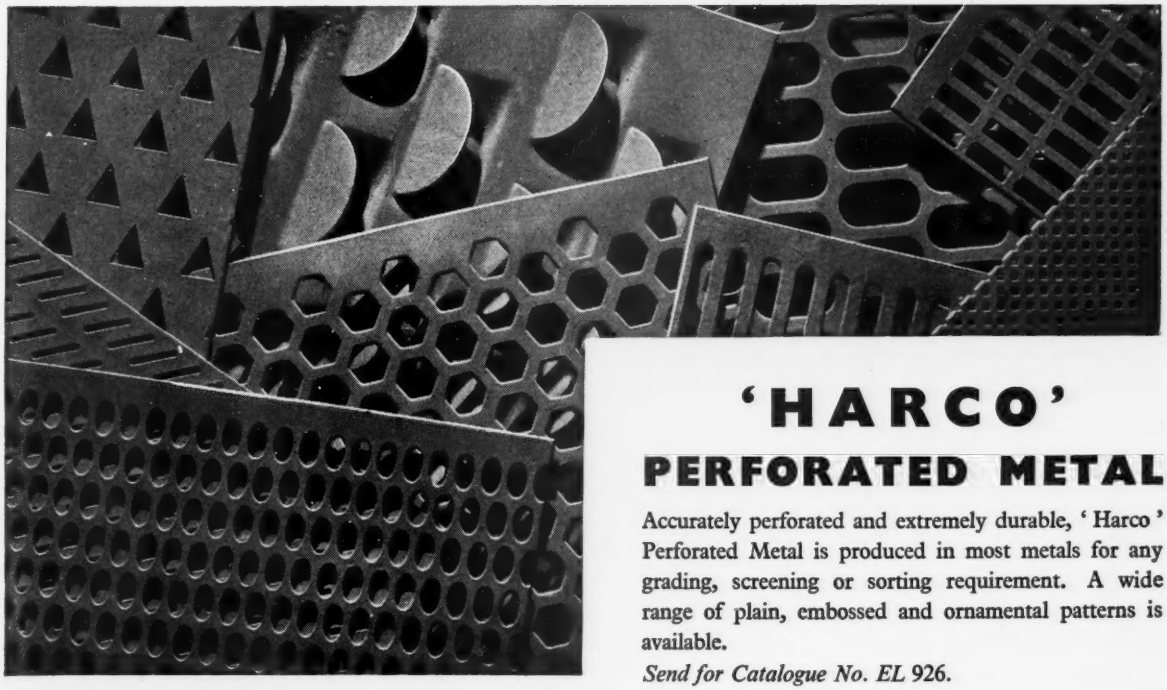
M.T.E.'s service to industry ranges from the supply of a complete range of components, to the design and building of the most intricate and complex control panel required for full automation.

MTE Control Gear Limited

LEIGH-ON-SEA ESSEX

Telephone: EASTWOOD 54281 (10 lines) *Telegraphic Address: ELECTRICS, LEIGH-ON-SEA*

MIDLANDS BRANCH OFFICE: 47 WARWICK ROAD, COVENTRY. *Telephone: Coventry 64561*



'HARCO'
PERFORATED METAL

Accurately perforated and extremely durable, 'Harco' Perforated Metal is produced in most metals for any grading, screening or sorting requirement. A wide range of plain, embossed and ornamental patterns is available.

Send for Catalogue No. EL 926.

Harvey

Telephone: GREenwich 3232 (22 lines)
G. A. HARVEY & CO. (LONDON) LTD., Woolwich Road, London, S.E.7

HE'S MAKING A SWITCHBOARD

For many years now, since electricity was first used on a large scale, SLATE has been widely used for switchboard panels in many types of installation. Still uniquely suited to this purpose, SLATE is durable, non-conductive, rigid and will not warp. We supply panels to specified dimensions with a tough precision finish, and are also equipped to undertake drilling to particular requirements.

THE BOW SLATE & ENAMEL CO, LTD.
B.R. Bow Depot, Old Ford Road
London, E.3
telephone : ADVance 2203

The Superlative SONISCOPE Regd.

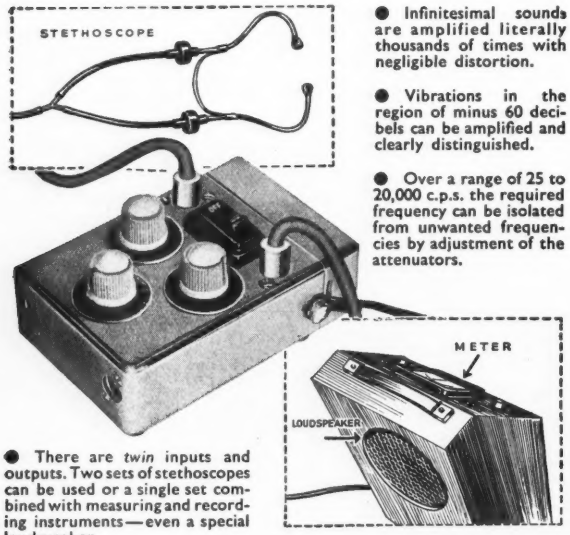
ELECTRONIC STETHOSCOPE

The performance of this instrument is so remarkable it must be heard to be believed

●

Here is the SONISCOPE, an outstanding achievement in *three* techniques — miniaturisation, electronics and acoustics. In sensitivity and selectivity, range and amplification, its performance goes far beyond any previously known standards and would be remarkable even in an instrument of normal size.

By registering the sounds, vibrations and rhythms of machinery, electrical plant and pipelines, the SONISCOPE has no equal in discovering the most minute imperfections.



● Infinitesimal sounds are amplified literally thousands of times with negligible distortion.

● Vibrations in the region of minus 60 decibels can be amplified and clearly distinguished.

● Over a range of 25 to 20,000 c.p.s. the required frequency can be isolated from unwanted frequencies by adjustment of the attenuators.

● There are *twin* inputs and outputs. Two sets of stethoscopes can be used or a single set combined with measuring and recording instruments — even a special loudspeaker.

● Size 4¼" × 3¼" × 1⅝". Battery operation.

Please ask for further particulars

AIRSONIC LTD.

Dept. E/3, 14 OLD QUEEN STREET, LONDON, S.W.1

Telephone: TRA*falgar* 2255/6/7

PB5

Shell Alvania Grease

for modern grease lubrication

SHELL ALVANIA GREASE, with its lithium hydroxy stearate base, and now with its new corrosion inhibitor, offers outstanding service for the majority of grease applications. It replaces the numerous conventional greases often used in the industrial and marine fields.

SHELL

LEADERSHIP IN LUBRICATION

For Electric Cables, too– you need green fingers

Given the same soil, the same fertilizers, the same sunshine and rain; using, apparently, identical methods; two gardeners do not get identical results. One gardener grows perfect blooms in profusion but, try as he will, he can never tell you exactly how he does it. We say he has green fingers. But what really seems to have happened is that much he has learned over the years has become so completely part of himself that he does the right thing instinctively.

Something of the same kind seems to happen in engineering—with a whole works playing the gardener. It is not a question of craftsmanship in the old sense, for it occurs even on a production line. But in a works that has been making cable (for instance) for years, the right decision seems 'natural', being based on knowledge that is so much a part of past experience that it is taken for granted. This is one reason why a name with a long history can still mean so much.

Crompton

ELECTRICAL EQUIPMENT

A GOOD NAME FOR CABLE

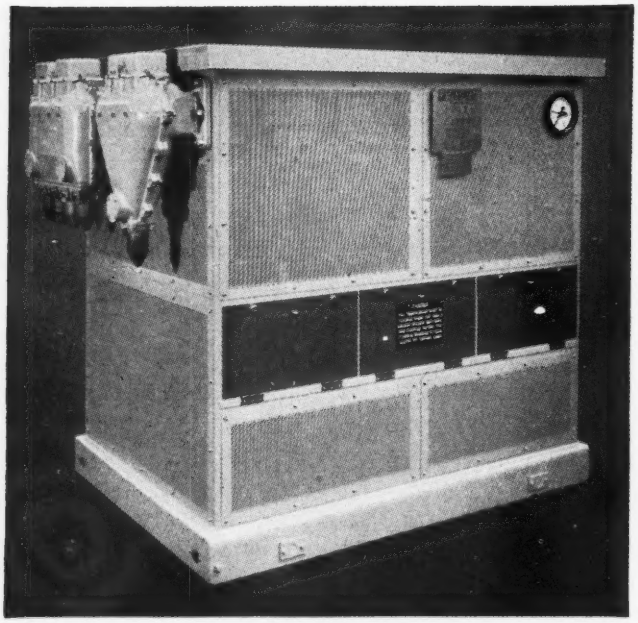
Made to the registered specifications of the Cable Makers Association

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2. TELEPHONE: CHANCERY 3333
TELEGRAMS: CROMPARK ESTRAND LONDON. CABLE WORKS: ALFRETON ROAD, DERBY. TELEPHONE: DERBY 45431

The benefits of silicone-insulated dry-type transformers are becoming better and better known:

* **No fire or explosion risk**
* **Reduced maintenance**
* **Frequent overloading permissible**
* **Smaller size and weight than O.N. or Class B units**
* **Dust, humidity and ventilation are no problem**
* **Can be placed at load centre, therefore making shorter low-voltage cable runs possible.**

The photograph below shows a 500kVA Ferranti dry-type, air-cooled distribution transformer with Class 'C' silicone insulation — B.S.2757 : 1956.



MS

Silicone insulated dry-type transformers ARE SAFER!

Here is a list of well-known British manufacturers already producing silicone-insulated dry-type transformers for the United Kingdom and overseas. These transformers have already been installed in:

Steel mills · Car factories
Newspaper plants · Food factories
Flour mills · Coal mines
Underground sub-stations
Office buildings · Blocks of flats
Departmental stores
Radar and airfield sites

BONAR, LONG & CO. LTD.
BRENTFORD TRANSFORMERS LTD.
BRUSH ELECTRICAL ENGINEERING CO. LTD.
THE ENGLISH ELECTRIC CO. LTD.
FERRANTI LTD.
FOSTER TRANSFORMERS LTD.
GRESHAM TRANSFORMERS LTD.
HACKBRIDGE & HEWITTIC ELECTRIC CO. LTD.
LONDON TRANSFORMER PRODUCTS LTD.
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
BRUCE PEEBLES & CO. LTD.
SOUTH WALES SWITCHGEAR LTD.
WODEN TRANSFORMER CO. LTD.

MIDLAND SILICONES LTD
(Associated with Albright & Wilson Ltd. and Dow Corning Corporation)

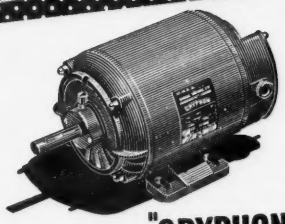
first *in British Silicones*

19 UPPER BROOK STREET · LONDON W1 · TEL: GRO 4551

Midland Silicones Limited manufacture in Great Britain the full range of silicone resins and elastomers used by transformer manufacturers in the construction of silicone-insulated dry-type units.

TBW/MS 91

BROOK



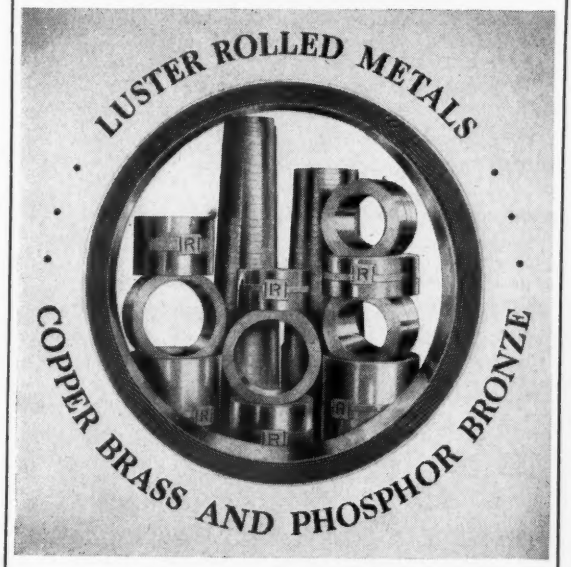
"GRYPHON"
The Fractional with
EXTRA POWER
FOR
★ Light Industrial Application
★ Domestic Appliances
★ Home Workshop Equipment

For Single, Two or Three Phase Supply

BROOK GRYPHON
FRACTIONAL HORSE POWER MOTORS

HUDDERSFIELD

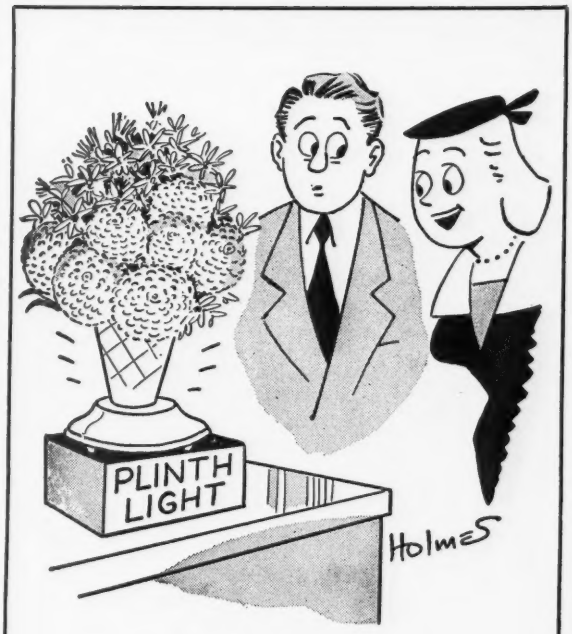
56/M



J. F. RATCLIFF (METALS) LTD.

NEW SUMMER ST., B'HAM 19

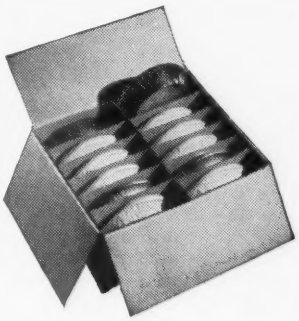
Phone: ASTON CROSS 3576 P.B.X. Grams: "RODENT, B'HAM 19"



"Oh! Aren't they lovely!
I'll have a bunch of those."

This cartoon is reproduced by courtesy of "Electrical & Radio Trading."

Of course, that's just a joke, for R.E.A.L. Plinths, on their own merits, sell steadily all the year round . . . and now that the Christmas Gift season is with us we're sure you'll be happy to know that there will be no increased prices of Plinths to mar your Yuletide profits.

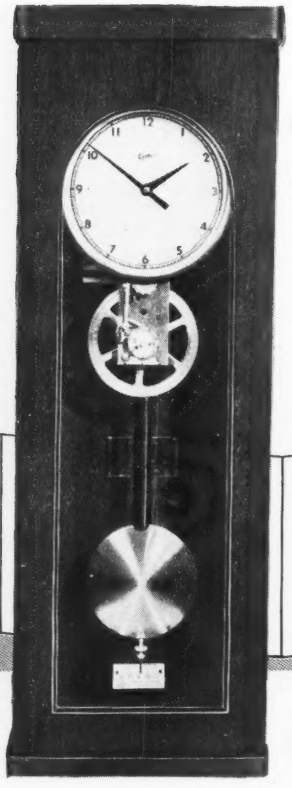


THE R.E.A.L. PLINTH LIGHT
Patent No. 659,876
List No. 5000
36/9 each inc. P.T.

THE R.E.A.L. JUNIOR PLINTH
List No. 5002
28/- each inc. P.T.

YOUR WHOLESALER CAN SUPPLY

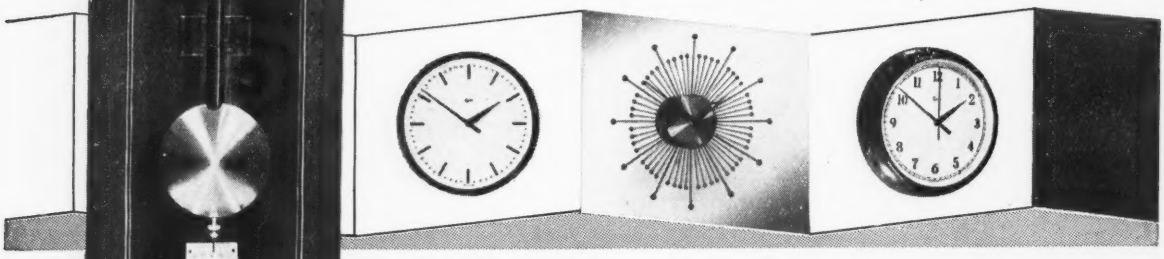
Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS BIRMINGHAM 18



Accurate time-all the time

Many of the newest buildings in Britain are equipped with Gibson Clocks. They are architecturally pleasing and essential to the smooth running of factories, hospitals, schools—indeed wherever accurate time-recording is necessary. Gibson Clocks are available either as individual clocks for one or two offices (worked by small self-contained battery-wound movements) or, for larger installations, on an impulse system in which one 'Master' clock controls any number of 'Slave' clocks. This method is accurate and is not affected by power failures. Time Recording, Job Costing and Sound Signal Systems can be incorporated in these installations. The available designs are varied and good: special designs can be carried out if required.

Clock systems are obtainable on a rental basis or may be purchased outright.



Time Recording. Job Costing and Sound Signal Systems can be incorporated in these installations.

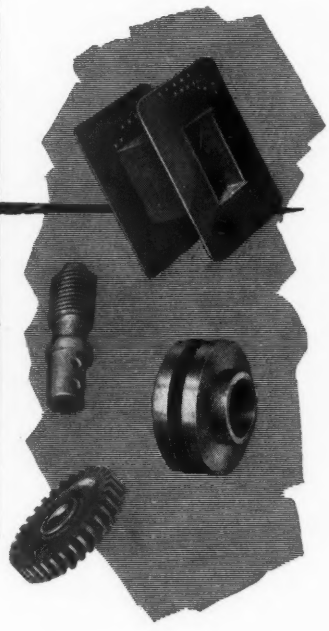
Gibson CLOCKS are made by **BAUME & CO. LTD**
Clock Division, 14A St. Cross Street
London, E.C.1. CHAncery 6187

PIRTOID

SYNTHETIC RESIN BONDED LAMINATE

brings you
MATERIAL SOLUTIONS
to your
CURRENT PROBLEMS

. . . because the range of PIRTOID Paper and Fabric base laminates affords all the machining qualities needed with consistent uniform dielectric and mechanised strength. Read this booklet, sent gladly on request.



H. CLARKE & CO. (MANCHESTER) LTD
Atlas Works · Patricroft · Manchester
Telephone Nos. ECCLES 5301-2-3-4-5

dmCK.4

ON LAND, SEA OR AIR . . .

You can count on cable jacketed with Du Pont neoprene

Durable jacketing of Du Pont neoprene lowers maintenance and replacement costs wherever cable is used. It resists sunlight, weathering and heat on aerial cable . . . withstands soil acids and electrolytic attack on cable buried directly in earth . . . stands up to salt water, oil and grease on cables aboard ship. You can count on extra durability, maximum protection when your cable is jacketed with Du Pont neoprene. Ask your supplier to show you his stock of neoprene-jacketed cable.

Neoprene/Hypalon products are made in this country. For details of suppliers or any other information required please write to the sole distributors in the U.K.

Durham Row Materials Ltd., 1-4 Great Tower Street, London E.C.3.

New ways in which neoprene-made products effect savings for you are contained in every issue of the Neoprene Notebook. New and unusual applications are clearly shown. Get on the mailing list. Fill out and mail the coupon today.

DU PONT
REG. U. S. PAT. OFF.

NEOPRENE

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Export Advertising, Elastomers Dept. ER-12.
Wilmington, 98, Delaware, U.S.A.

Name..... Position.....

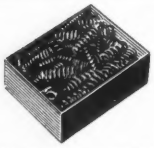
Firm .....

Address .....

.....

What sorts of springs do you need?

No. 760. 3 doz. Assorted Light Compression Springs. 1″ to 4″ long, 22 to 18 S.W.G., ¼″ to ½″ diam. 6/6 each.



No. 757. Extra Light Compression, 1 gross Assorted, ½″ to ¾″, ½″ to 2″ long, 27 to 20 S.W.G. 15/- each.

No. 98A. 3 doz. Assorted 1″ to 4″ long, ½″ to ¾″ diam., 19G to 15G. 5/6 each.

No. 758. Fine Expansion Springs. 1 gross Assorted ½″ to ⅝″, ½″ to 2″ long, 27 to 20 S.W.G. 15/- each.

No. 388. ½ gross Assorted Small Expansion Springs. ⅜″ to 1¼″, 18G to 21G. 9/6 each.

Compression? Expansion? Long? Short? Light? Heavy? Let Terry's BOXES OF ASSORTED SPRINGS settle the question. Just the job for you experimental people — a simply unlimited assortment from our tremendous range of springs of every variety. The 9 boxes shown here are only a few — but why not let us send you a full list — post free.

TERRY'S

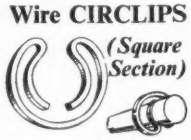
ASSORTED SPRINGS

HERBERT TERRY & SONS LIMITED · REDDITCH · WORCS

(Makers of quality Springs, Wireforms and Presswork for over a century)

*** Interested in Springs 1957 Edition of "Spring Design and Calculations"— post free 12/6d.**

Cut production costs with Terry Wire CIRCLIPS



(Square Section)

We can supply from stock in sizes from ⅛″ to ⅝″.

No. 466. ½ gross Assorted Small Expansion Springs ⅜″ to 1½″ long, 3/32″ to 3/16″ diam., 21G to 24G. 6/6 each.

No. 753. 3 doz. Assorted Light Expansion ¼″ to ½″ diam., 2″ to 6″ long, 22 to 18 S.W.G. 10/6 each.

No. 1024. 20 Compression Springs 12″ long. ½″ to ½″ diam., 24G to 18G, suitable for cutting into shorter lengths; and 30 Expansions 1½″ to 12″ long, 5/32″ to ⅝″ diam., 22G to 16G. 24/- each.

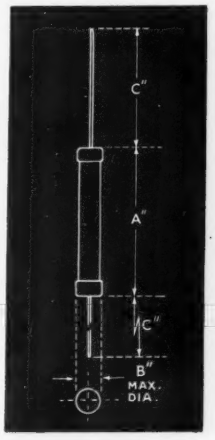
No. 1013. 1 gross Small Coil Compression Springs, ¼″ to 1½″ long, 3/32″ to 7/16″ diam., 24G to 19G. 6/- each.

HY31

PAINTON

By Appointment to the Professional Engineer

HIGH STABILITY CARBON RESISTORS



ELECTRICAL CHARACTERISTICS

The electrical characteristic of a High Stability Carbon Resistor depends upon the physical size of the units and upon the ohmic value. All the data given below relates to the Type 73 Resistor. To obtain the equivalent ohmic values to which the information is applicable in the other four sizes of Resistor the following factors should be applied :

Type 72 x ½ Type 74 x 2 Type 75 x 4 Type 76 x 8

FULL LOAD STABILITY

Up to 100 K.ohms the resistance change at full load with an ambient temperature of 70°C. is less than 0·75% (average 0·25%) after 1,000 hours operation. At 1 Megohm the change is less than 1% (average 0·75%).

N.B. On D.C. loading the maximum voltages stated in RCL 112 should be observed.

AGEING AND SHELF DRIFT.

Up to 100 K.ohms the average change is 0·25% in 12 months (never greater than 0·75%). For 1 Megohm resistors the average change is 0·6% in 12 months (never greater than 1·25%).

CLIMATIC

Exposure to the two cycles of H.I. humidity as laid down in RCS 112 shows a change of less than 0·7% (average 0·4%) up to 100 K.ohms. At 1 Megohm the change is less than 1% (average 0·7%).

TROPICAL EXPOSURE

Eighty-four days exposure to the standard 25°C./35°C. 100% humidity cycling shows a change of less than 1% (average 0·5%) up to 100 K.ohms. At 1 Megohm the change is less than 2% (average 1·6%).

TEMPERATURE COEFFICIENT

The temperature coefficient is less than 0·04%/°C. up to 100 K.ohms. At 1 Megohm the coefficient is approximately 0·055%/°C.

NOISE

Noise which is generated in a resistor, as the result of a direct voltage applied across it, varies according to the ohmic value of the resistor, the noise decreasing as the ohmic value increases. The noise is also influenced by factors such as the size of the resistor.

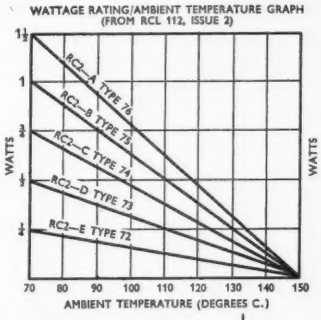
For noise which falls within frequency range of 0 to 10 Kc./sec., the Painton high stability resistors have noise levels which are between 0·05 and 0·4 microvolts of noise per applied direct volt, when the resistor is dissipating power at its maximum wattage rating.

VOLTAGE COEFFICIENT

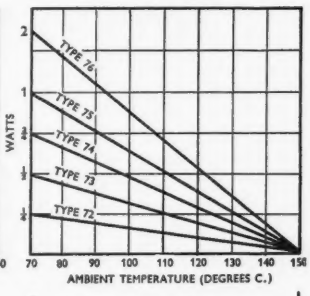
Not exceeding 0·002% per volt D.C.

DERATING FOR AMBIENT TEMPERATURES EXCEEDING 70° C.

WATTAGE RATING/AMBIENT TEMPERATURE GRAPH (FROM RCL 112, ISSUE 2)



COMMERCIAL DERATING CURVE



TYPE	RESISTANCE RANGE (ohms)	VALUES OUTSIDE THIS RANGE MAY BE QUOTED FOR SEPARATELY.	
72	±1% 4—700K	±2% 4—1·0M	±5% 4—2·5M
73	±1% 4—1·0M	±2% 4—2·0M	±5% 4—5·0M
74	±1% 20—2·0M	±2% 20—4·0M	±5% 20—10·0M
75	±1% 20—3·0M	±2% 20—5·0M	±5% 20—10·0M
76	±1% 20—5·5M	±2% 20—9·0M	±5% 20—50·0M

TYPE		72	73	74	75	76
Normal Commercial Rating 70°C—watts		¼	½	¾	1	2
R.C.S.C. style		RC2-E	RC2-D	RC2-C	RC2-B	RC2-A
R.C.S.C. Rating at 70°C—watts		¼	½	¾	1	1½
R.C.S.C. Rating at 100°C—watts		⅛	¼	½	¾	1
DIMENSIONS IN INCHES	A	½	11/16	1 1/16	1⅜	2 1/16
	B	5/16	5/16	5/16	11/16	11/16
	C	1½	1½	1½	1½	1½

PAINTON

Northampton England

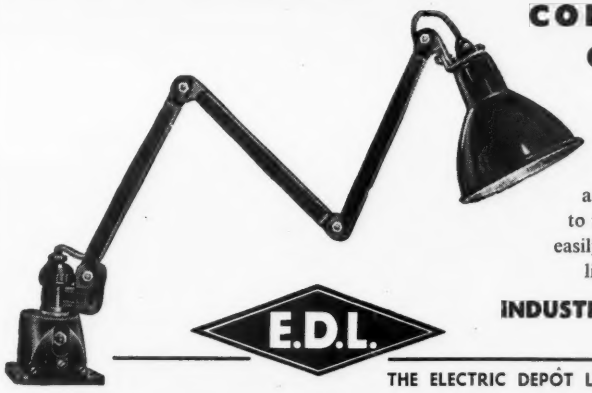
Rolled Thread Screws

TAKE no chances about your supplies of Rolled Thread Screws—specify ORMOND and so make sure of both quality *and* quantity — delivered right on time and straight from our extensive stocks. Send for lists, which also detail Cut Thread Screws, immediately available. For your individual requirements we will gladly submit special quotations.

ENGINEERING ORMOND COMPANY LTD.

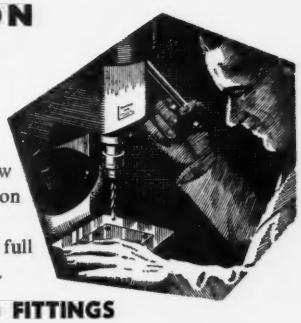
THE ORMOND ENGINEERING CO. LTD., Ormond House, Rosebery Avenue, London, E.C.1

Telephone : TERminus 2888 *Telegrams : "Ormondengi, Smith"*



CONCENTRATION ON THE JOB

Concentration produces results. We are specialists in Industrial Local Lighting. E.D.L. lamps throw a clear, shadow-free light right on to the job. They are sturdy, easily adjusted, free from sag. Get full lighting efficiency—with E.D.L.



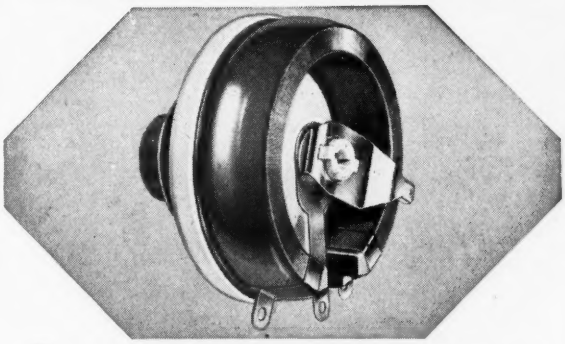
E.D.L.

INDUSTRIAL LOCAL LIGHTING FITTINGS
for mains or low voltage

THE ELECTRIC DEPOT LTD., PRITCHETT STREET, BIRMINGHAM 6 Phone: ASTon Cross 1381

TOROSTATS

Toroidally Wound Potentiometer-Rheostats



CRESSALL TOROSTATS are a particularly robust form of vitreous enamelled toroidal potentiometer on a ceramic base. This construction gives great mechanical strength and good heat dissipation. Cressall contact brush design ensures perfect contact with negligible wear.

made by

Cressall

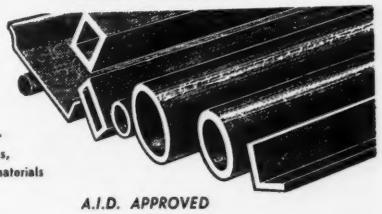
THE CRESSALL MANUFACTURING COMPANY LIMITED
(A subsidiary of The Expanded Metal Co. Ltd.)
ECLIPSE WORKS · TOWER STREET · BIRMINGHAM 19. Telephone: Aston Cross 2666
LONDON OFFICE: BURWOOD HOUSE · CAXTON STREET · S.W.1. Telephone: ABBey 7766

INSULATING
TAPES
AND
MATERIALS
of every type

TAPES Including: Varnished Empire, Glass, Silk, Black Adhesive, Egyptian and India Cotton, Rubber, Pitch and Bitumen, P.V.C., etc.

MATERIALS Including: Empire, Glass, and Silk Fabrics, Varnished Cotton and Glass Sleevings, Mica, Leatheroid, Presspahn, Combined Slot Insulation, Bakelite, Paxolin, etc.

Also
MACHINED PARTS AND STAMPINGS
in Mica, Micanite, Fibre, Bakelite, Paxolin, Ebonite, Asbestos, Pressboard, and many other materials

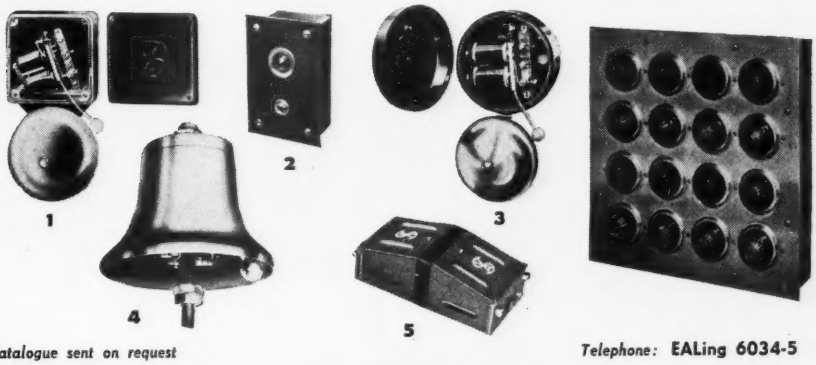


A.I.D. APPROVED

PAXTONS **(ELECTRICAL) LIMITED**
Weston-Super-Mare *Phone 1357*

SAX
Electrical Products

1. Ironclad Bells, Low and High Voltage, a.c. and d.c.
2. Luminous call systems relays, indicators, etc.
3. Bakelite Case Bells and Buzzers, Low and High Voltage, a.c. and d.c.
4. Underdome Type Bells for Ambulance, Factory and Fire Tenders.
5. Bell Transformers, Metal cased, 5-500 watt.
6. Multi-way Domed Glass Luminous Indicator.



Catalogue sent on request

JULIUS SAX & CO. LTD. **24 COMMERCE ROAD** *Telephone:* **EALing 6034-5** **BRENTFORD, MIDDX.**

Otter

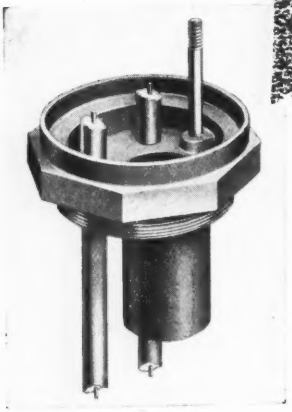
TUBESTAT

The *simplest* and most *reliable* of all immersion heater thermostats.

List Price

14/1d

subject to the usual trade discounts



WRITE FOR LEAFLET No. 9

OTTER CONTROLS
LIMITED

Otters 'Ole, Market Street
Buxton, Derbyshire
Phone: Buxton 650 (2 lines)

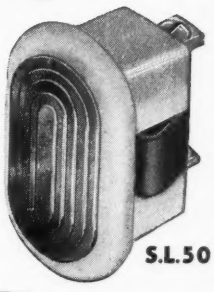
ARCOLECTRIC SIGNAL LAMPS

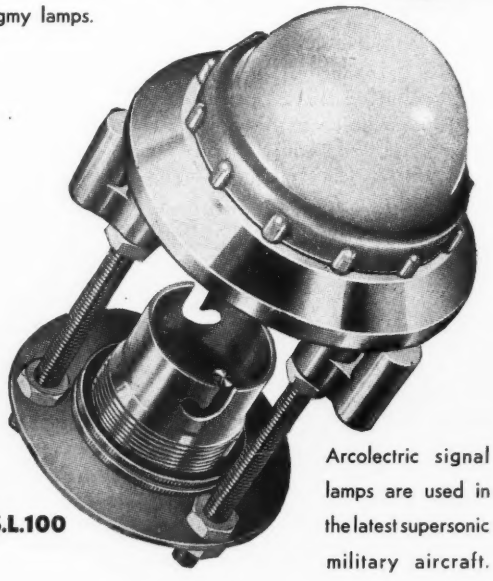
S.L.78: Neon signal lamp for all mains voltages. A miniature low cost mains signal lamp, single $\frac{3}{8}$" hole fixing.

S.L.90/SB: Low voltage signal lamp for M.E.S. bulbs.

S.L.50: Neon signal lamp with snap-in fixing.

S.L.100: Mains voltage signal lamp for 15 watt B.C. pigmy lamps.





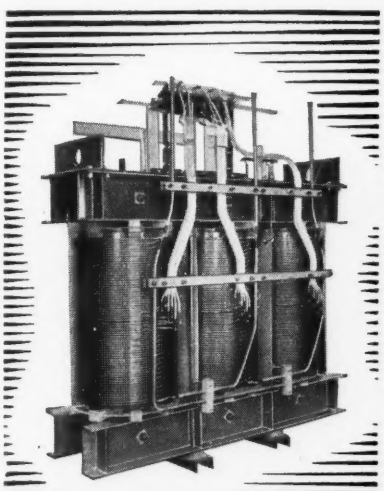
Arcolectric signal lamps are used in the latest supersonic military aircraft.

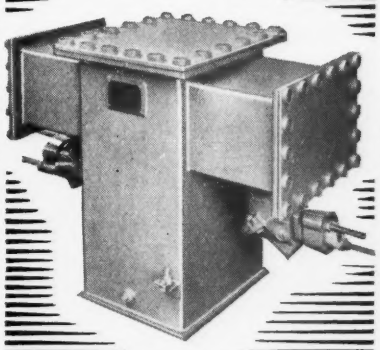
Write for Catalogue 131

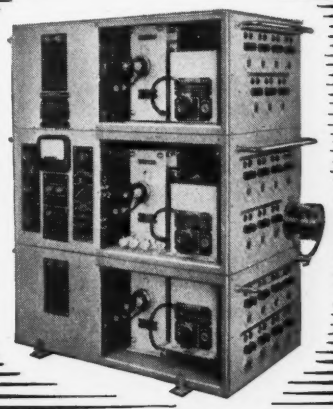
Agents required for Australia and Sweden

ARCOLECTRIC SWITCHES · LTD

CENTRAL AVENUE, WEST MOLESEY, SURREY. Tel.: MOLESEY 4336





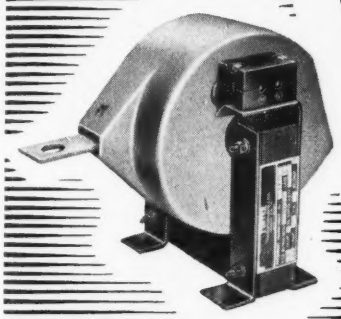


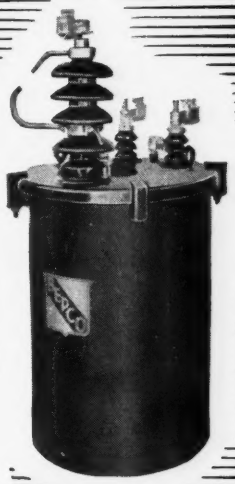
FOSTER

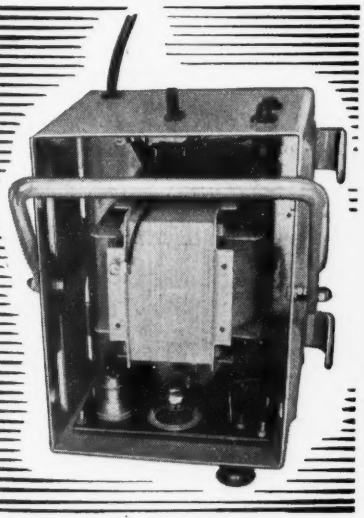
TRANSFORMERS

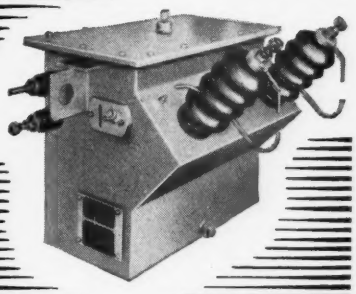
LIMITED

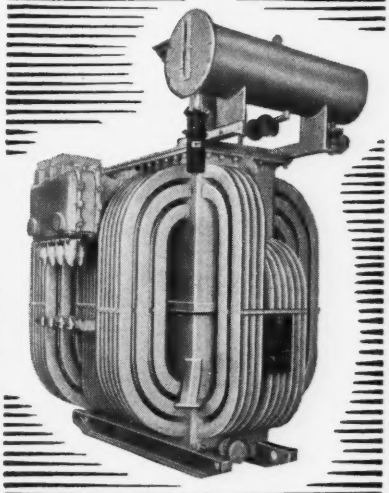
For over Fifty years
Industry's
Transformer Specialists
in all aspects of Control,
Distribution and Regulation
of Electrical Power.









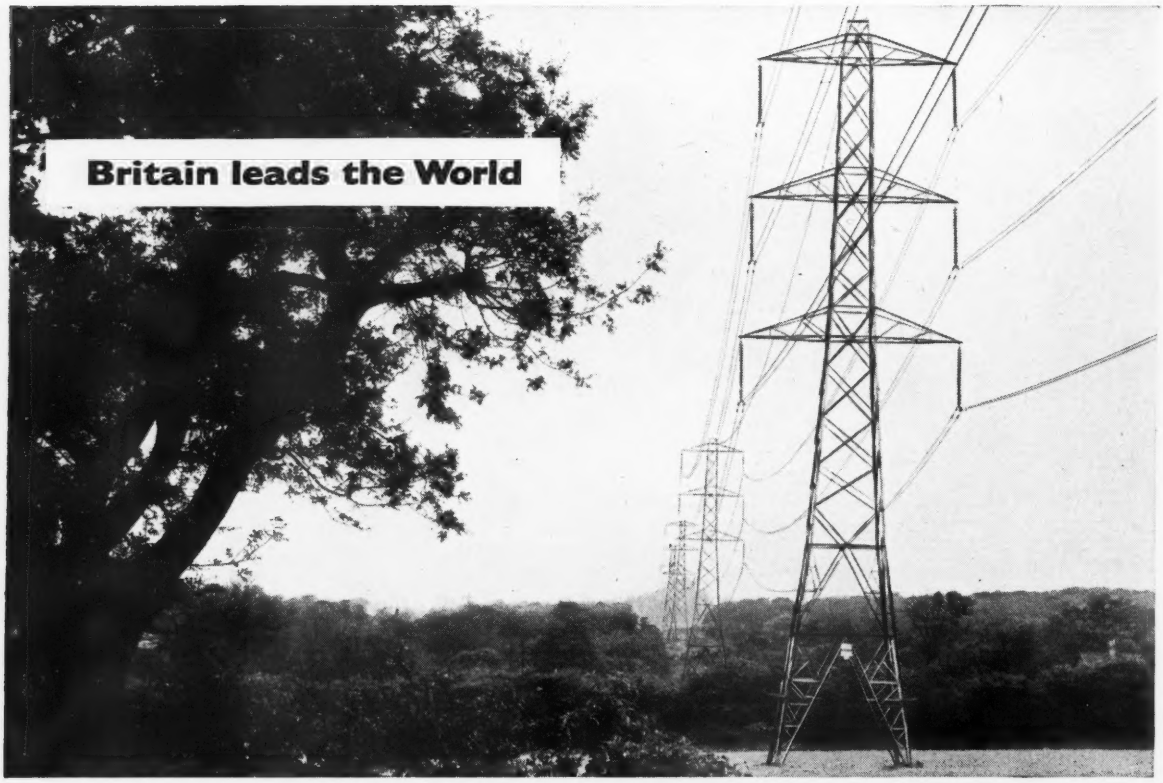


Write today for our illustrated Broadsheet F.M.12

FOSTER TRANSFORMERS LTD · SOUTH WIMBLEDON · LONDON S.W.19

A MEMBER OF THE LANCASHIRE DYNAMO GROUP

C.2



Why not put the Power Lines Underground?

As part of the programme to provide Britain with power for prosperity, enough nuclear power stations will be built to provide 5 to 6 million kilowatts of power. Work was started in January, 1957, on the construction of the first two nuclear stations for the Central Electricity Authority and on the third in September last.

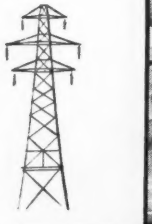
The search is going on for other nuclear power station sites on the coast and large river estuaries.

To carry power to the industrial areas, to the towns and country, main transmission lines must be built to connect the power stations to supply points feeding the distribution networks. These are the 132,000 volt Grid and 275,000 volt Supergrid lines. They are as necessary as the power stations.

Why, it is sometimes asked, must these main transmission lines be placed above ground, to the possible detriment of the landscape? Why cannot underground cables be used? It is because of the prohibitive cost. Overhead lines operating at 275,000 volts cost about £25,000 a mile. Underground cables for this voltage would cost between £300,000/£400,000 a mile — twelve to sixteen times as much.

Overhead lines are not, of course, peculiar to Great Britain. They are common in all countries of the world for carrying electricity cheaply from the power stations to the industries and communities that need it.

If Britain's prosperity power is to fulfil its purpose, it must be cheap power, and it cannot be cheap without economical transmission and distribution by overhead lines.



The pylons of Britain are the outward sign of a new hope for Britain's future. They bring cheap power to help the farmer increase production. They bring the farmer's wife the cleanliness and convenience of a modern kitchen like this one.

This series of advertisements is being published by the Central Electricity Authority so that everyone will understand the nation's electric power programme and why it is necessary to have not only electric power stations, but also pylons to carry the power where it is needed.

. . . pitch fibre means safer conduit . . .

In addition to manufacturing Temple Tube to B.S. 2760/56 for drains and sewers, we offer you the same material in alternative thicknesses and joints for CABLE CONDUIT.

"Temple Tubes" maintain the highest standards of strength, chemical resistance, insulation, resilience and endurance required for conduit.

Reduce your installation and maintenance costs by insisting on using Temple Tube Pitch Fibre CONDUIT.

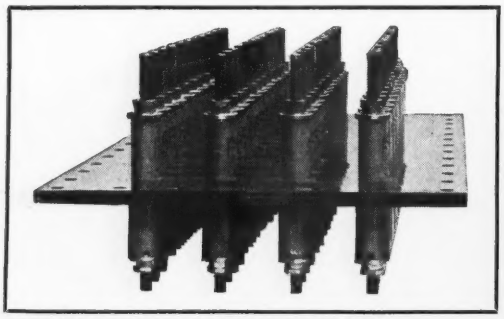
TEMPLE·TUBES

PITCH FIBRE PIPE

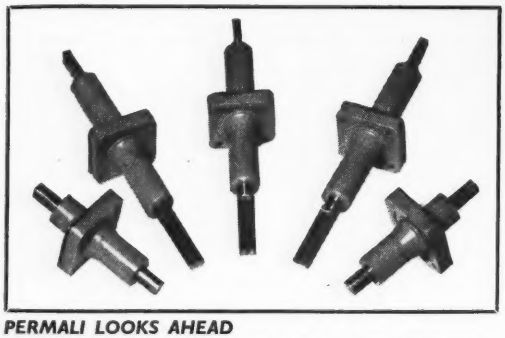
Send your enquiries to:

TEMPLE TUBES, TEMPLE MILL, MARLOW, BUCKS. Telephone: MARLOW 9 or 460

Proprietors: Limehouse Paperboard Mills Ltd.



PERMALI OFFERS A COMPLETE SERVICE
Permali produce the complete job from raw material to finished article—This EHT transformer terminal board, made from a Permali base with Dialam through-bushings, is one of many different components designed, manufactured, machined, assembled and tested entirely by Permali Ltd.

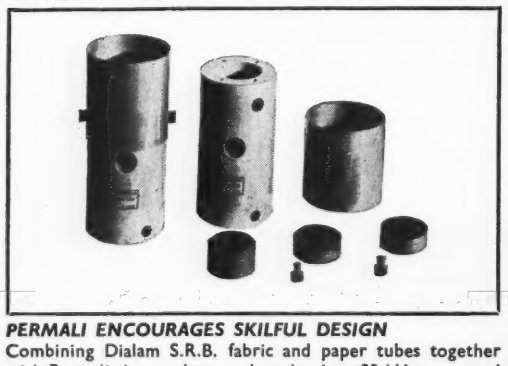


PERMALI LOOKS AHEAD
These cast-resin insulators, now being produced in quantity, constitute another new advance in manufacturing technique —made possible by constant research and development in the Permali laboratories.

PERMALI OFFERS NEW POSSIBILITIES
New design opportunities are opened up with Permaglass glass-fibre reinforced laminates. This welding transformer cover is typical of the many products for which this unique material is suited.

PERMALI CATERS FOR SPECIAL OPERATING CONDITIONS
Made from Grade TH material, this bus barrier board is specially moisture resisting for tropical and high humidity applications.

PERMALI FOR PRECISION
This 132 kV arc-control device demonstrates the machineability and strength of Permali. Note how simply metal fittings can be combined with the material.



PERMALI ENCOURAGES SKILFUL DESIGN
Combining Dialam S.R.B. fabric and paper tubes together with Permali throat plates and studs, these 33 kV arc control devices employ Permali manufactured materials to their best advantage.

When you need INSULATION . . . use the

PERMALI

COMPLETE SERVICE

for the design and development of components in:—

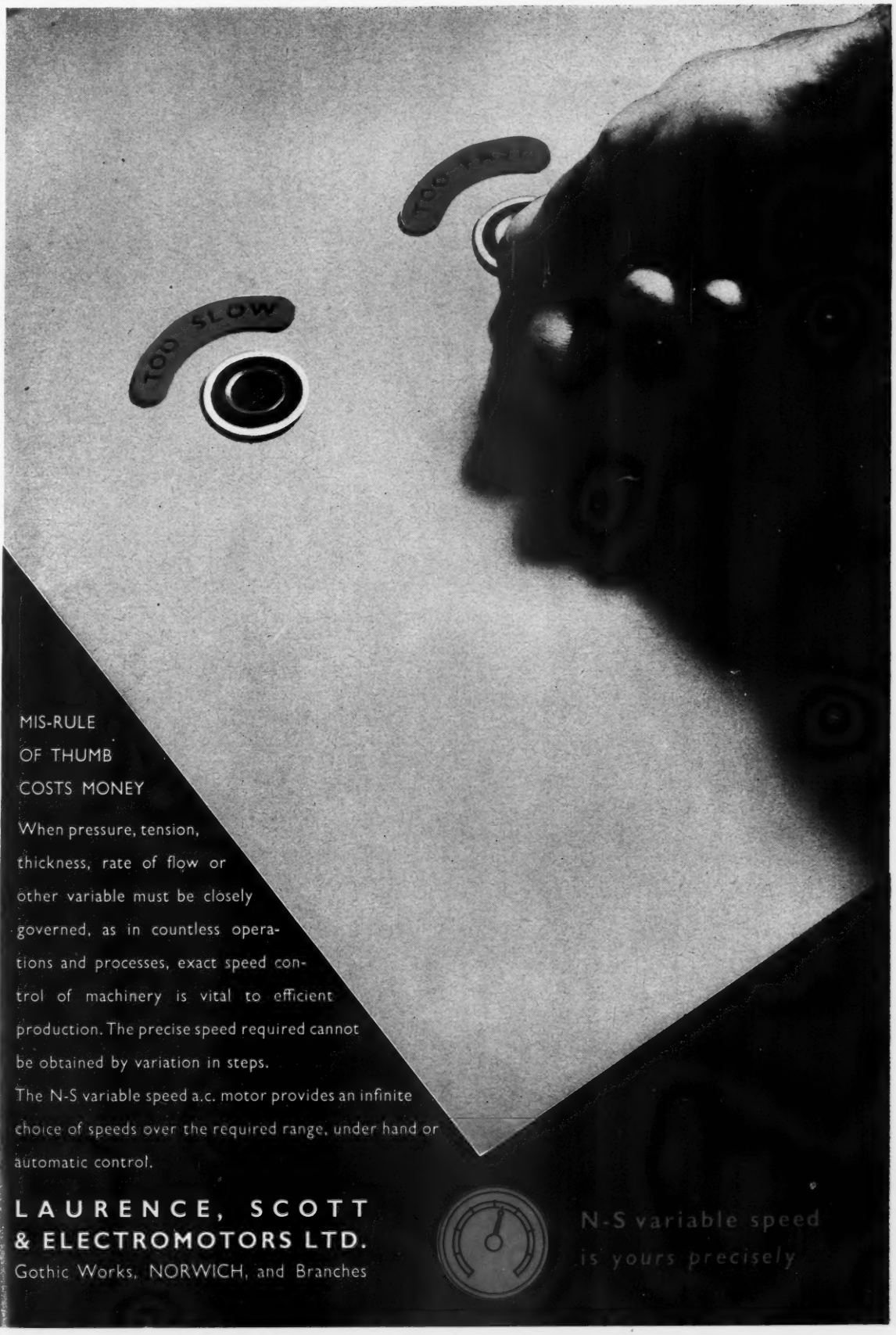
PERMALI —the insulating material outstanding for strength
PERMAGLASS —Glass fibre reinforced plastics
PERMAFLON —the P.T.F.E. plastic material with a unique combination of properties.
DIALAM —S.R.B. Paper and Fabric tubes.

Grades EH and TH Permali are MoS, Admirality, G.P.O., K.E.M.A. approved, fully meet BS 2572 and Def 5,000.

KEEP ABREAST OF NEW DEVELOPMENTS *and write for the latest technical data—or send us your print for quotation.*

PERMALI LIMITED

Bristol Road · Gloucester · England · Telephone 24941



MIS-RULE
OF THUMB
COSTS MONEY

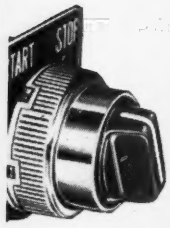
When pressure, tension, thickness, rate of flow or other variable must be closely governed, as in countless operations and processes, exact speed control of machinery is vital to efficient production. The precise speed required cannot be obtained by variation in steps.

The N-S variable speed a.c. motor provides an infinite choice of speeds over the required range, under hand or automatic control.

LAURENCE, SCOTT & ELECTROMOTORS LTD.
Gothic Works, NORWICH, and Branches

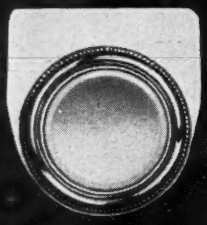
N-S variable speed is yours precisely

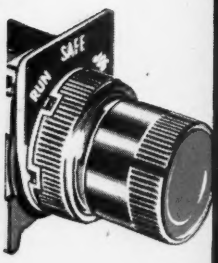
Electrical Review
13 December 1957



PUSHBUTTONS

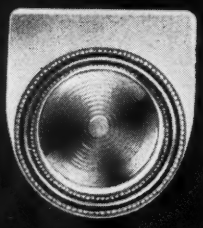
Smartly engineered, in minimum size, ruggedly built, simple to mount and connect, these modern pushbutton units not only look better but will prove their worth in more reliable, more trouble-free operation—longer.

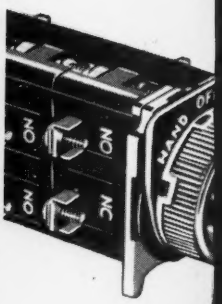




INDICATING LIGHTS

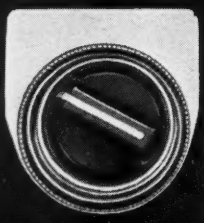
Designed in two styles—the exclusive Pres Test with its built-in testing feature and the standard—both in resistor and transformer types, both compactly designed to match the space-saving feature of the entire line.



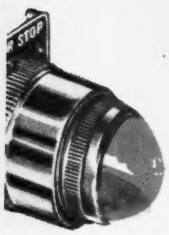


SELECTOR SWITCHES

Using the same ingenious and compact contact block as the pushbutton units—include knob and key types. The multiplicity of circuit combinations obtainable is almost unlimited.



Full particulars from Publicity Department, Bedford



IGRANIC

heavy duty oil-tight control units

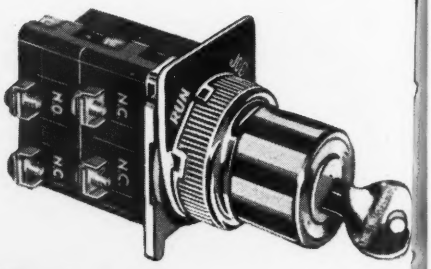
IGRANIC ELECTRIC CO LTD
head office and works Bedford

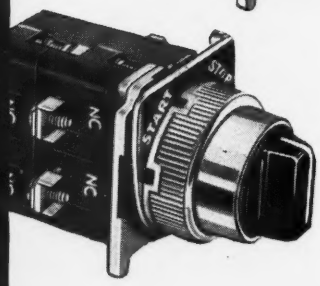
LONDON & EXPORT OFFICE VICTORIA STATION HOUSE 191 VICTORIA STREET SW1

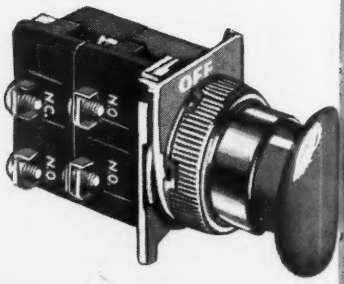
A METAL INDUSTRIES M GROUP COMPANY

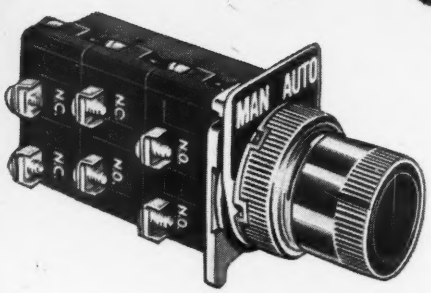
DISTRICT OFFICES: BIRMINGHAM BRISTOL CARDIFF EAST ANGLIA GLASGOW LEEDS MANCHESTER NEWCASTLE SHEFFIELD

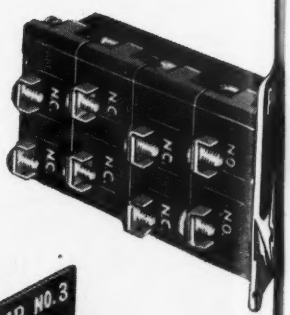
an infinite number of combinations

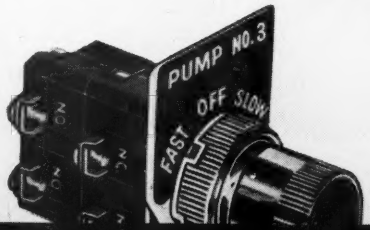




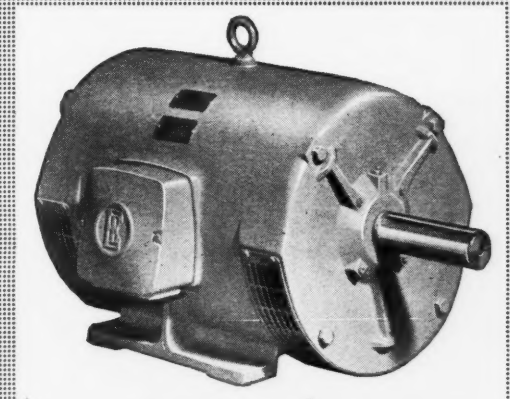


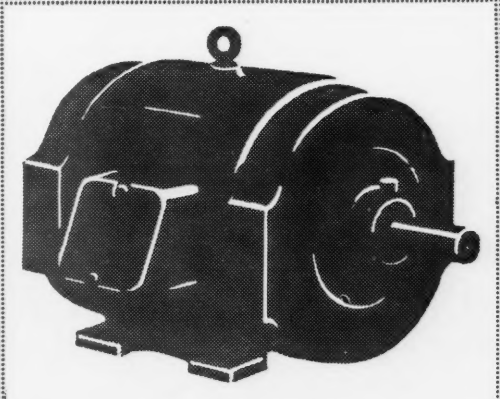






same size – same weight





...but *this motor* gives *far more power*

The new 'ENGLISH ELECTRIC' standardised ventilated motors using class 'E' insulation and built to the latest B.S. draft specification CW(ELE)6246 give far more power for the same frame size. For a given horsepower the motor required is smaller and lighter and costs less.

These new motors—from ½ h.p. to 50 h.p. in six frame sizes—have endshields and terminal boxes which turn to any of four 90° positions for floor, wall, or ceiling mounting. Publication DM/230 giving details of the range will be sent on request.

Most sizes AVAILABLE FROM STOCK

STANDARDISED AND INTERCHANGEABLE

'ENGLISH ELECTRIC'

B.S.D. ventilated motors

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

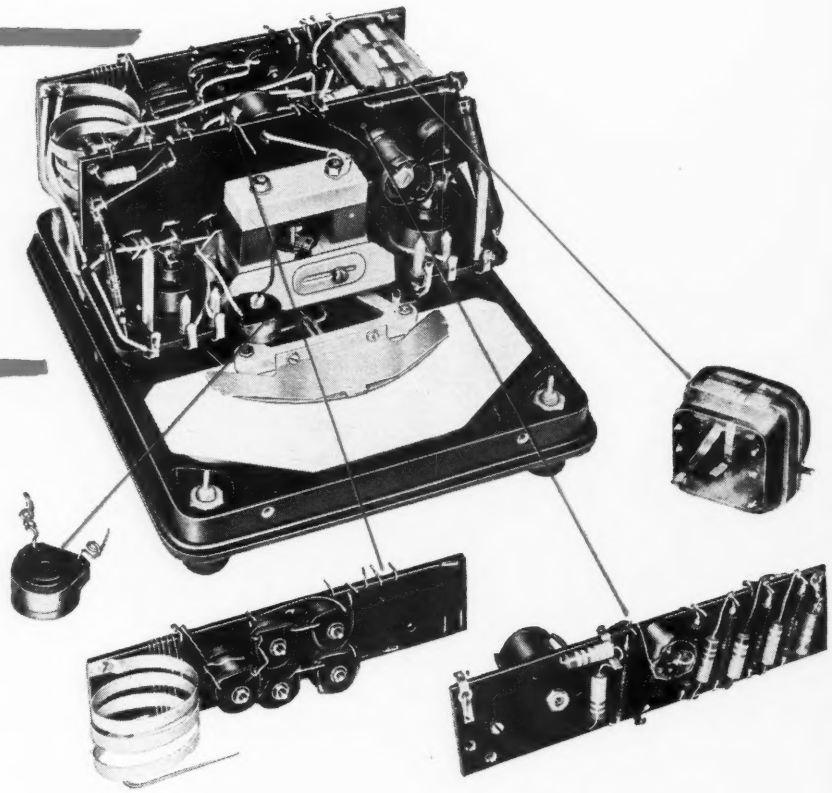
Industrial Motor Works, Bradford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

DM. 67K7

The famous Avometers are possibly the most widely used instruments of their type in the World and have an excellent record of service under all climatic conditions, even at arctic temperatures. In tropical climates, however, there is a constant risk of derangement due to humidity, heat, and the development of fungoid growths. To meet these conditions, the manufacturers of Avometers have produced special types known as Models 7X, 8X and 8(S)X, which are suitable for continuous use in any extremes of heat or cold. In these instruments, certain components are potted in Araldite epoxy resin, which has the advantages of remarkable adhesion to metals, ceramics, etc., good dielectric properties, low shrinkage, resistance to moisture and extremes of climate, and complete freedom from micro-biological attack.

Poles apart



Araldite epoxy resins have a remarkable range of characteristics and uses.

They are used

- ★ **for bonding metals, porcelain, glass, etc.**
- ★ **for casting high grade solid insulation**
- ★ **for impregnating, potting or sealing electrical windings and components**
- ★ **for producing glass fibre laminates**
- ★ **for producing patterns, models, jigs, tools, etc.**
- ★ **as fillers for sheet metal work**
- ★ **as protective coatings for metal, wood and ceramic surfaces**

Araldite *epoxy resins*

Araldite is a registered trade name

Aero Research Limited *A Ciba Company · Duxford · Cambridge · Telephone: Sawston 2121*

AP316

I'm more than a mere order number

'I like to deal with suppliers who treat their customers as individuals rather than order numbers. You know — the personal touch. You get it with J. & P.'

'Johnson & Phillips? They carry out some pretty big electrical projects, don't they?'

'They do. But they still manage to make every customer feel they're pleased to handle his business.'

'Shows the advantage of dealing with a medium-sized firm.'

'Yes indeed. J. & P. are just the right size for me.'

THE RIGHT-SIZED FIRM FOR YOU

J. & P. manufacture cables, transformers, switchgear, capacitors, etc., and undertake electrification schemes for many of the largest industrial concerns in this country and overseas.

They have been in the business since 1875.

But they still retain that regard for the individual customer that only the smaller firms can have.

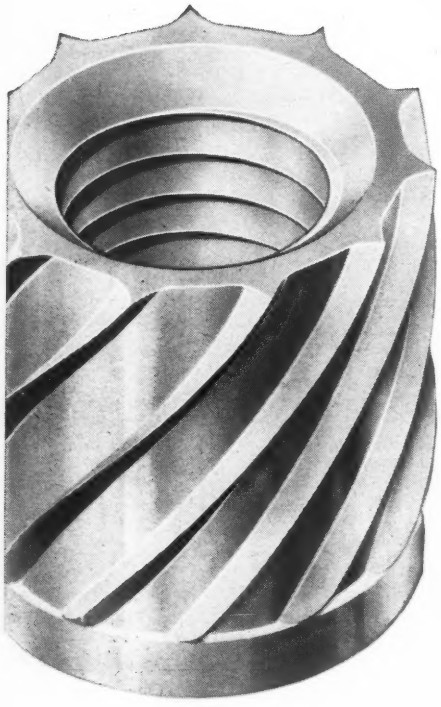
JOHNSON & PHILLIPS

A Power in the Electrical World

JOHNSON & PHILLIPS LTD · CHARLTON · LONDON S.E.7

Nettlefolds

provide a strong thread



IF YOU WANT a threaded metal hole to replace damaged or stripped threads you need a bush that cuts its own thread

in soft castings or plastics

Nettlefolds Insert Bushes, in cadmium plated steel: with hardened spiral external thread: B.A. internal thread to B.S.57: manufactured to close tolerances: in boxes of 1,000.

Write for leaflet containing comprehensive information.

GUEST KEEN & NETTLEFOLDS (MIDLANDS) LIMITED
Screw Division: BOX NO. 24, HEATH STREET, BIRMINGHAM 18

s/1.n/3100

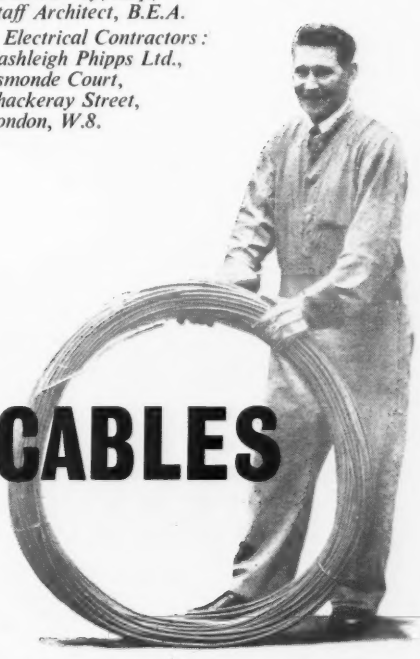
GKN

BICC M.I. Cables were installed throughout the B.E.A. Air Terminal in Cromwell Road, London.

Architect:
R. S. Harvey, Esq.,
Staff Architect, B.E.A.

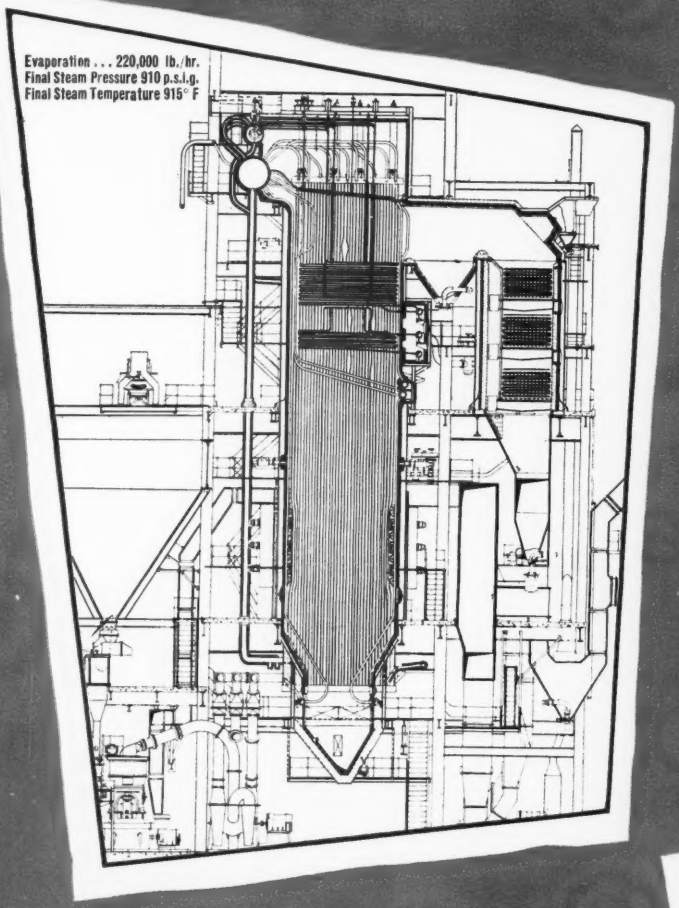
Electrical Contractors:
Rashleigh Phipps Ltd.,
Esmonde Court,
Thackeray Street,
London, W.8.

Another job well done with BICC M.I. CABLES



BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1

Steam raising for industry



IC build boilers to suit the individual steam raising requirements of every industry.

Whatever the problem, IC steam generating equipment ensures the best use of fuel resources.

Allied equipment covers every requirement from fuel handling to ash disposal.

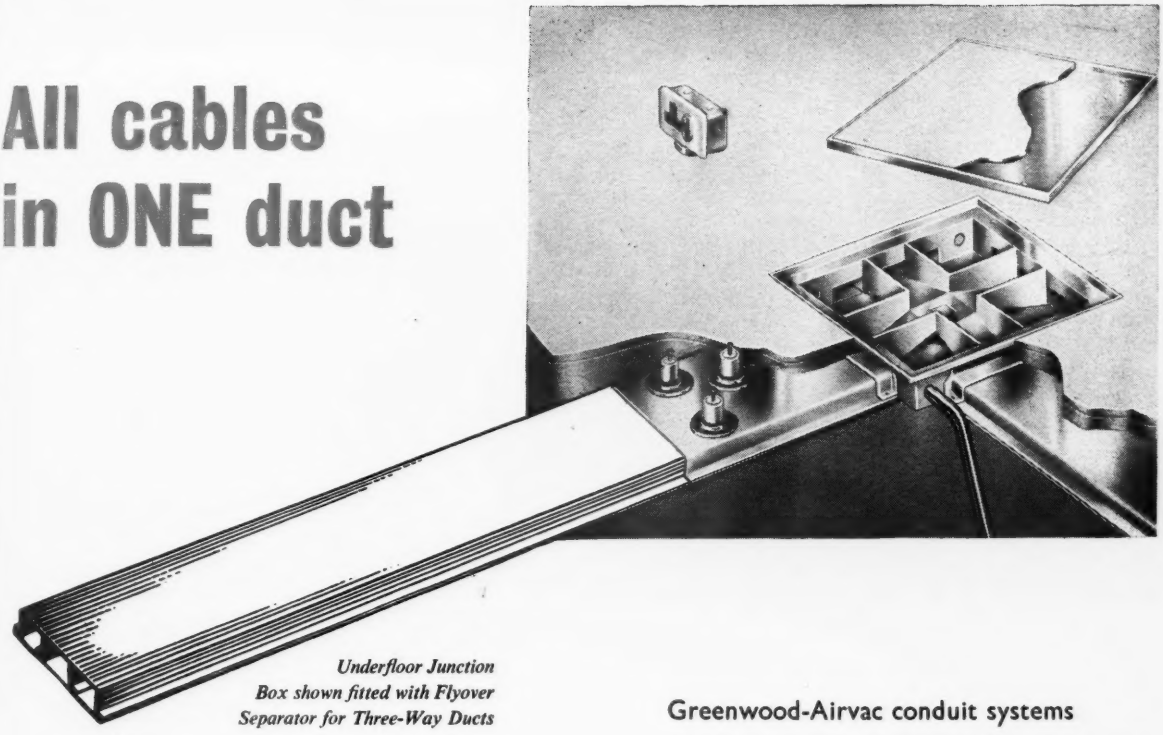
An example of an installation at a large British paper mill is illustrated here.

INTERNATIONAL COMBUSTION LIMITED

IC

NINETEEN WOBURN PLACE, LONDON, W.C.1. Telephone: TERminus 2833

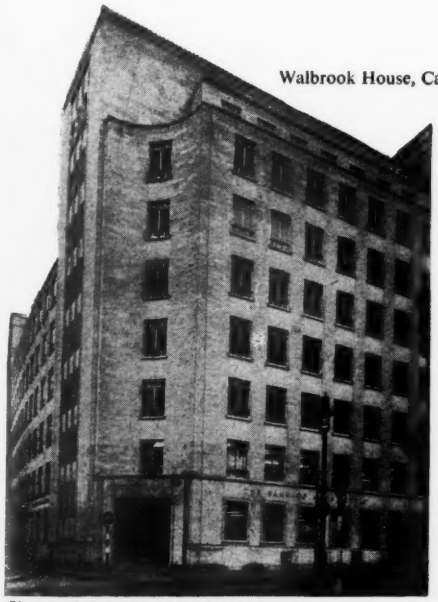
All cables in ONE duct



Underfloor Junction Box shown fitted with Flyover Separator for Three-Way Ducts

Greenwood-Airvac conduit systems provide for all cables to be housed in one duct with adequate screening between telephone and power cables. The unique construction of the underfloor system enables it to be laid where necessary in only 1½" of screed, and for applications where underfloor fitting is impracticable, a skirting system is readily available. Please write or telephone for the publication 'Greenwood-Airvac Conduit Systems' or call to see the demonstration layout in the Beacon House showroom.

Walbrook House, Cannon Street, E.C.4



Arch:—Henry Tanner Esq.
Cont:—F. G. Minter Ltd.
El. Cont:—Berkeley Electrical Eng. Co. Ltd.

Photograph by courtesy of "The City Press"
Another Greenwood-Airvac Conduit underfloor installation

Greenwood-Airvac *conduit systems*

GREENWOOD'S AND AIRVAC VENTILATING COMPANY LTD
Patentees, Designers and Manufacturers of Ventilating Equipment and Electrical Conduit Systems
BEACON HOUSE, KINGSWAY, LONDON, W.C.2. CHAncery 8135/6/7. 'Airvac', London

Stock answer...

By specifying JMC standard headed contacts you can relieve stock problems — for delivery of almost any quantity can normally be made at once. To this, add the advantages of lower cost, sound design and maximum operating efficiency.

The stock answer to many problems of contact selection — and a convincing one — is the adoption of JMC standards.

A series of technical data sheets is free on request.

One of the Specialised Products of

Johnson Matthey

JOHNSON, MATTHEY & CO., LIMITED

73-83 HATTON GARDEN, LONDON, E.C.1. Telephone: Holborn 6989

Vittoria Street, Birmingham, 1. Tel: Central 8004. 75-79 Eyre Street, Sheffield, 1. Tel: 29212

SC1

ORIGINAL MANUFACTURERS OF

Self-aligning Conduits

SALT-GLAZED STONEWARE MULTIPLE and SINGLE WAY with SELF-ALIGNING JOINTS

also

Rectangular Troughing and Glazed Bridge Insulators for Underground Electrical Cables

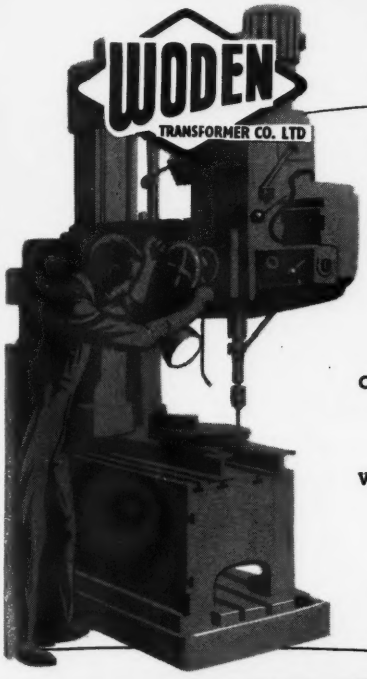
PROMPT DELIVERY

ALBION CLAY CO. LTD.

ALBION WORKS, WOODVILLE, Nr. BURTON-ON-TRENT

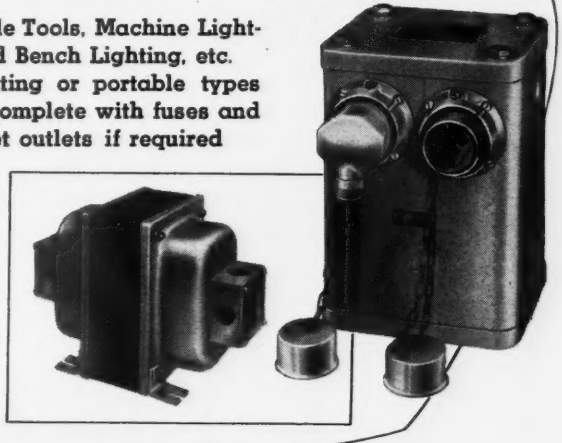
Telephone : Swadlincote 7061, 7062, 7063 Telegrams : "Albion, Phone, Woodville"

WODEN TRANSFORMER CO. LTD



LOW voltage transformers

for Electric Portable Tools, Machine Lighting, Garage and Bench Lighting, etc. Bench, wall mounting or portable types can be supplied complete with fuses and plug and socket outlets if required



Outputs of 110 V. or 25 V. or low voltage ranges 6 to 36 to order

Woden units are soundly engineered and competitively priced.

May we quote you?

WODEN TRANSFORMER CO. LTD

MOXLEY ROAD BILSTON · STAFFS

Phone: BILSTON 41959

BM/W.2925

Phone: WOKING 4733

CRATER

THE SWITCH SPECIALISTS

TAILOR MADE!

SWITCHES

NEW

CONTROL BOXES

To individual requirements.
Knob or key operated.
With or without pilot lights up to 4, 6 or 8 way switches.

CRATER PRODUCTS LTD • WOKING • SURREY

WILLIAM GEIPEL LIMITED ESTD. 1871

CONTROL GEAR
A.C. and D.C.
for all Industrial purposes

STARTERS
DIRECT ON LINE
PUSH BUTTON
REVERSING
STAR DELTA

REGULATORS
RESISTANCES
RELAYS
CONTACTORS
SWITCHES
ETC.

A full range of Standard Equipment. Special Equipment designed and made to Customers' requirements.

VULCAN WORKS · 156-170 BERMONDSEY ST · LONDON · S.E.1

Pressure Diecastings

in Mazak Zinc Alloy

Produced to B.S.S. 1004 under strict Metallurgical Control

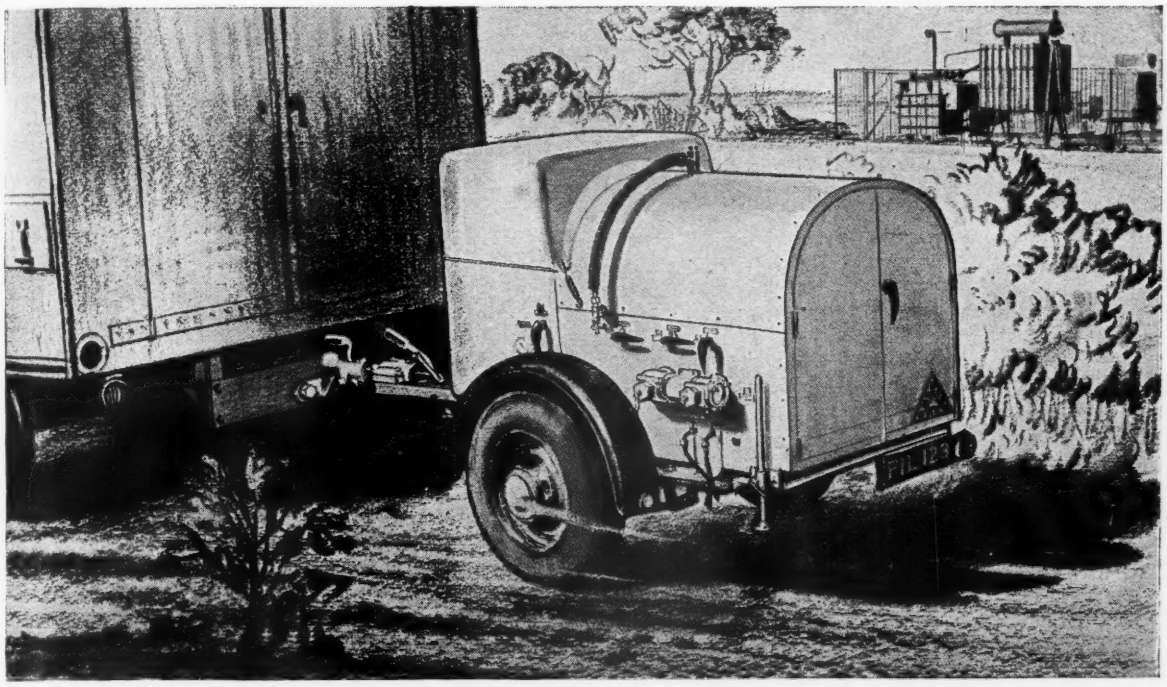
A.I.D. APPROVED

Members Zinc Alloy Die Casters Association

CERTIFIED ZINC ALLOY ZAMCA DIE CASTERS

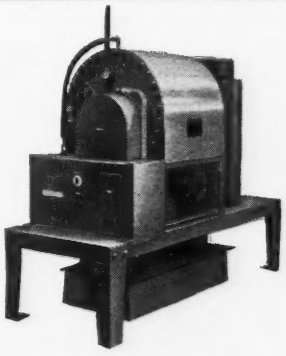
WESTERN DIECASTING LTD.
Phoenix Street, Maze Street
Barton Hill, Bristol 5. Phone 5-6593

Permanent or fully mobile



Stream-Line filters remove all the impurities

Where insulating oil is concerned, partial purification is not enough. To ensure prolonged use, it is essential to remove *all* the impurities. That's why electricity supply undertakings and manufacturers of electrical equipment all over the world use Stream-Line filters for this vital job. For large transformer stations requiring a permanent installation, or for scattered sub-stations where a portable unit is necessary, you'll find Stream-Line filters at work. Our engineers will be pleased to discuss *your* filtration problems at any time.



Only Stream-Line Filters offer:

- Entire elimination of solid impurities, even the finest colloidal carbon.
- Complete dehydration including the removal of dissolved water.
- Absolute de-aeration including the removal of dissolved gases.

STREAM-LINE FILTERS

STREAM-LINE FILTERS LTD · INGATE PLACE · LONDON · S.W.8

A Member of the VOKES Group

Telephone MACaulay 1011

SF/17

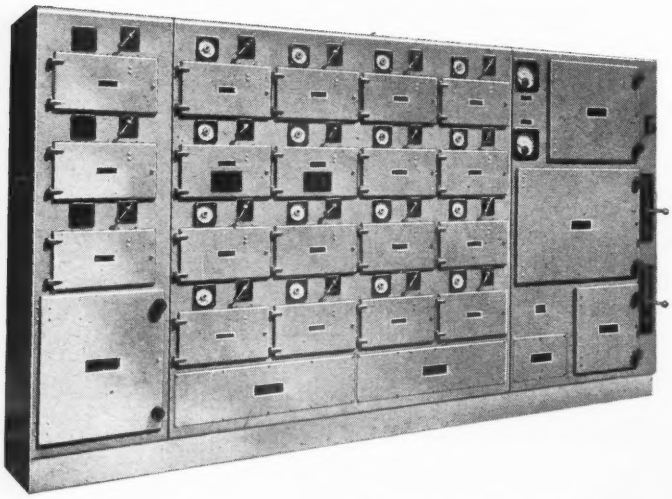
AIREDALE
ELECTRICAL & MNFG. CO., LTD.

TELEPHONE IDLE 686 || HEAD OFFICE AND WORKS || TELEGRAMS 'SWITCH' IDLE

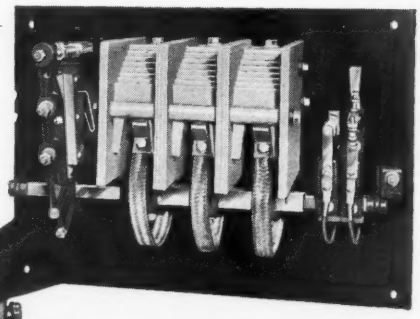
APPERLEY BRIDGE. BRADFORD

LONDON OFFICE TRAFALGAR 3559
225 GRAND BUILDINGS TRAFALGAR SQUARE W.C.2.

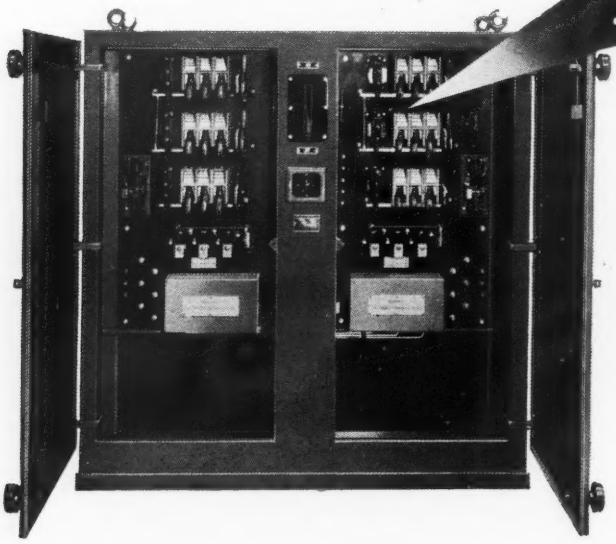
A.C. AIR BREAK CONTROL GEAR
(CSA APPROVAL No. 13738)
CONTACTORS, TIMERS, RELAYS
AUTOMATIC STARTERS
MANUAL STARTERS
L.T. OIL IMMERSED SWITCHGEAR
CIRCUIT BREAKERS
SWITCHBOARDS
CUSTOM BUILT COMPOSITE GEAR



On the left is illustrated a typical Multi-Motor Switchboard with busbar-fed individually isolated starter cubicles



Twin 35 h.p. Star-Delta Cubicle with Central Isolator

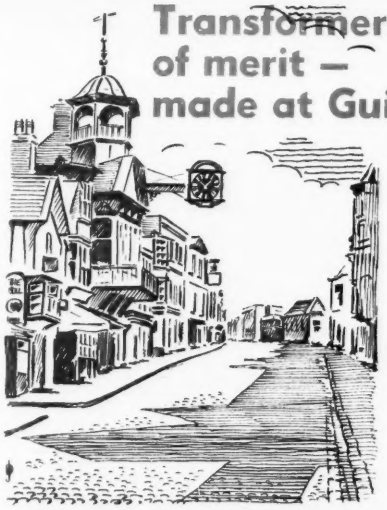


A.C. AIR BREAK CONTROL GEAR

Contactors to BSS. 775 : 1956 Type-tested by an Asta Proving Station are fitted throughout the range of Standard Automatic Motor Starter Specifications and Custom Built Composite Control Gear by . . . AIREDALE

AUTOMATIC MOTOR CONTROL GEAR

Transformers and Rectifiers of merit — made at Guildford



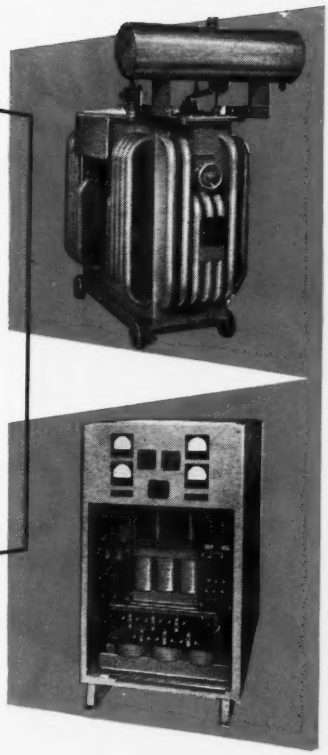
HIGH STREET, GUILDFORD

You can depend on—

TRANSFORMERS & RECTIFIERS LTD.

TRANSFORMERS
- ★ Distribution
- ★ Electronic Equipment
- ★ Rectifiers
- ★ H.F. Heating
- ★ Low Voltage Supplies
- ★ Welding
- ★ Furnaces, etc.

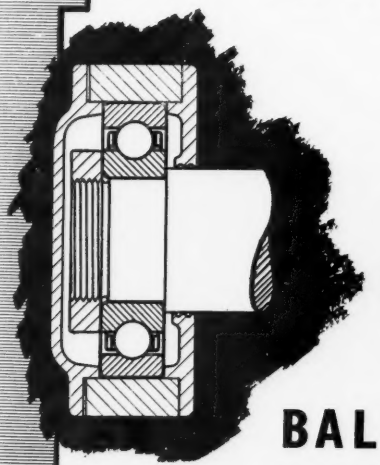
RECTIFIERS
- ★ Battery Charging
- ★ D.C. Motors
- ★ General Power Supplies
- ★ Engine Starting
- ★ Welding, etc.



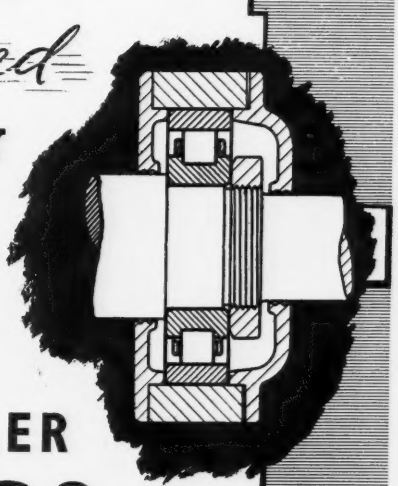
Dept. E.1
MILLMEAD · GUILDFORD
SURREY

Tele: Guildford 66764 *Grams: Transrect, Guildford*

For every • **LOAD**
• *Speed*
• **DUTY**



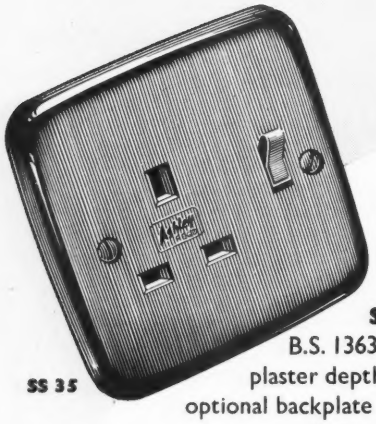
HOFFMANN



BALL AND ROLLER BEARINGS

THE HOFFMANN MANUFACTURING CO. LTD. CHELMSFORD ESSEX

Ashley REGD 13 AMP. RING CIRCUIT ACCESSORIES

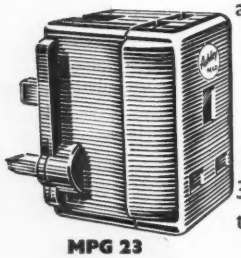


SS 35

J 401

SOCKETS & SWITCHSOCKETS. B.S. 1363 & 2814. Brown or Cream. Flush, for plaster depth or deep socketboxes. Surface, with optional backplate I.E.E. 207G. Safety shuttered. Quiet switch, silver contacts, nylon pad.

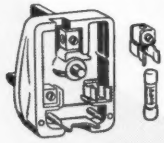
FUSED PLUG. B.S. 1363. Brown or Cream. Block terminals. B.S. 1362 Cartridge Fuse-Link, 13 Amp. supplied, 10, 5 or 2 Amp. also available. Optional, High Impact resistant type, Black.

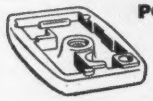


MPG 23

SOCKET ADAPTOR. Complies I.E.E. 611(a). Brown or Cream. Safety shuttered twin outlets. B.S. 1362 13 Amp. Cartridge Fuse-Link.

SELECTIVE ENTRY SPUR BOX (Pat.). B.S. 816 3½" dia. x 1¼" x 2" fixing centres. Four cable entries, those unused closed by shutters integral with cover. Three block terminals each taking up to four 7/.029 conductors.





PG 13

SK 31

Literature and technical service, with pleasure.

Ashley REGD.

ASHLEY ACCESSORIES LIMITED, ULVERSTON, LANCASHIRE

Telephone: Ulverston 3333 *Telegrams:* Ashley, Ulverston

MEMBER OF THE ASHLEY GROUP

AY 102

TRANSFORMERS

MANUFACTURED UP TO 500 k.V.A
FOR INDUSTRIAL AND DISTRIBUTION PURPOSES

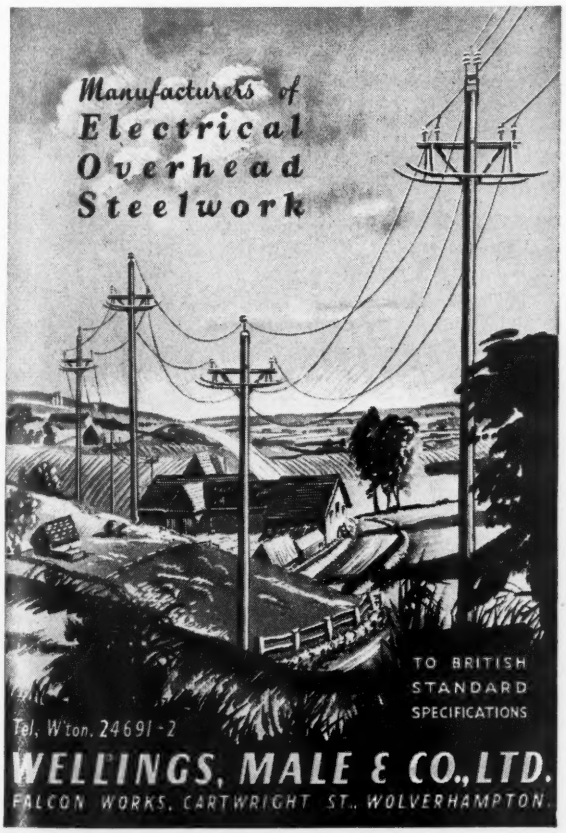
GOOD DELIVERY AT COMPETITIVE PRICES

Selenium Metal Rectifiers Manufactured Up to 30 K.W.

AUSTIN WALTERS & SON, LTD.,
TRANSFORMER DIVISION
AYRES ROAD, MANCHESTER, 16
Tel: TRAfford Park 1827

CW 3265

Manufacturers of
Electrical Overhead Steelwork



TO BRITISH STANDARD SPECIFICATIONS

Tel. Wton. 24691-2

WELLINGS, MALE & CO., LTD.
FALCON WORKS, CARTWRIGHT ST., WOLVERHAMPTON.

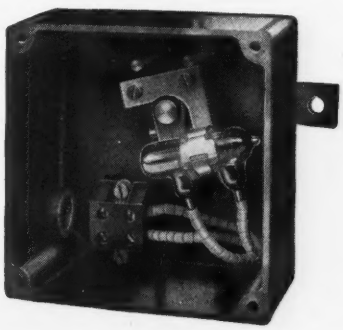
C

LIVERPOOL CABLE carries the C·M·A label

Certification Mark

THE LIVERPOOL ELECTRIC CABLE CO. LTD.
LINACRE LANE · BOOTLE · LIVERPOOL 20

MERCURY SWITCHES
★
MERCURY SWITCH UNITS
★
MERCURY SWITCH RELAYS
★



I.A.C. LTD.

Ref. ER, 10 CHASE ROAD LONDON, N.W.10

Electrix LTD

a leading name in the Manufacture of Electric Domestic Appliances

ELECTRIX VACUUM CLEANERS

With up the stairs skid £20 (*plus tax*)
Other models from £11.15.0 (*plus tax*)

ELECTRIX FLOOR POLISHER

Price £16.10.0 (*plus tax*)

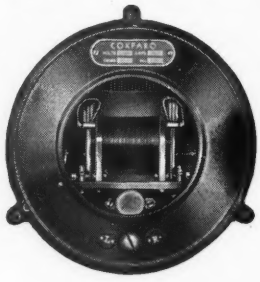
ELECTRIX SPRAY UNIT

Price £9.7.0 (No tax)

Further information and literature from:
STERLING WORKS · DAGENHAM · ESSEX · ENGLAND · Tel.: Dominion 4545

Automatic

VOLTAGE REGULATORS



The COXPARO will "Smooth things out"

- SUITABLE FOR A.C. AND D.C. MACHINES
- ACCURATE TO ± 1% OR LESS
- SIMPLE EFFECTIVE DESIGN
- COMPLETELY SELF CONTAINED
- CONTROL KNOB PROVIDES ± 10% OF DECLARED VOLTAGE
- INSTALLED IN A FEW MINUTES
- PRACTICALLY NO MAINTENANCE

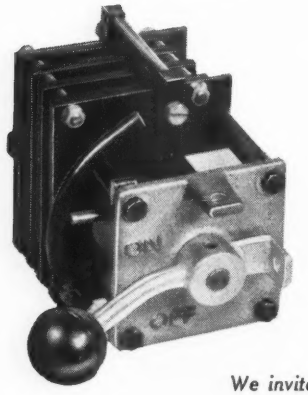
COX-WALKERS LTD.

NORTH-EASTERN ELECTRIC WORKS
FEETHAMS – – DARLINGTON Phone 2387

"Colne"

ISOLATOR SWITCHES

660 v. 60 ampere capacity A.C. with door interlock mechanism.



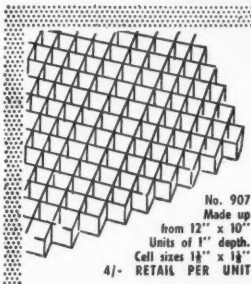
We invite your enquiries

Manufactured by

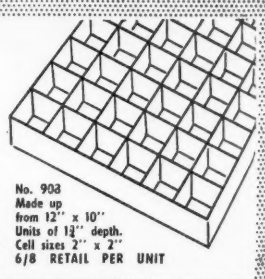
Colne

SWITCHGEAR (K & W) LTD.
formerly Electrical Products (Colne) Ltd.
Walton Street, Colne, Lancs.
Phone: Colne 1394/5

TAILOR MADE PLASTIC LOUVRES!
REDUCED PRICES!
PROMPT DELIVERIES!



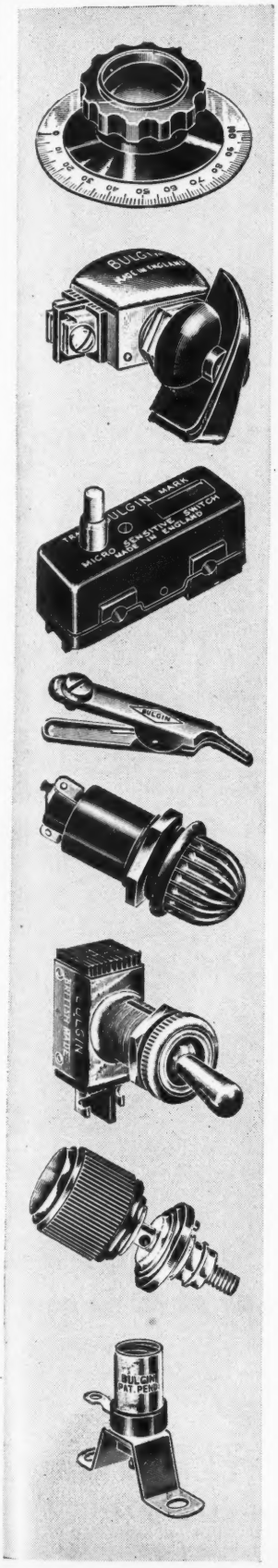
No. 907
Made up from 12" x 10"
Units of 1" depth.
Cell sizes 1⅛" x 1⅛"
4/- RETAIL PER UNIT

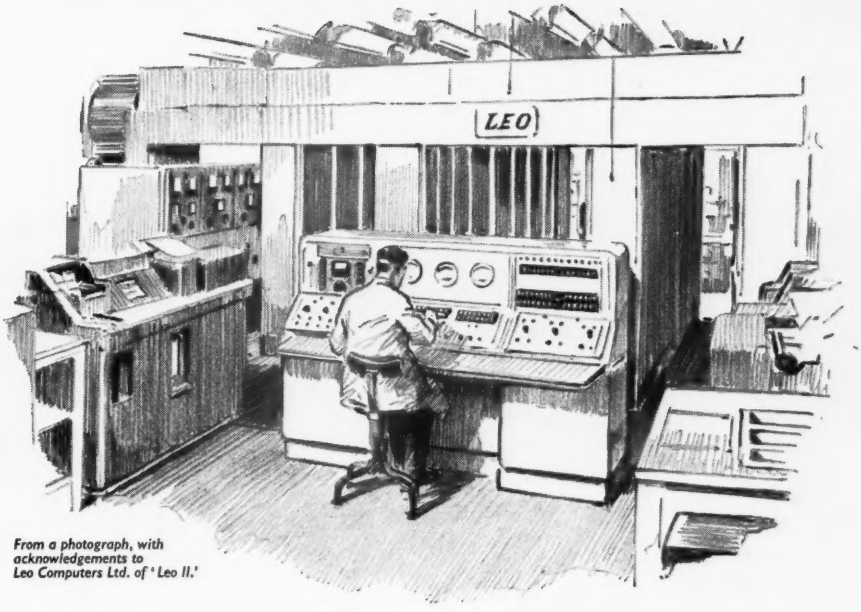


No. 908
Made up from 12" x 10"
Units of 1¾" depth.
Cell sizes 2" x 2"
6/8 RETAIL PER UNIT

SEND FOR CATALOGUE SHOWING OTHER LOUVRES

Manufactured by
LUMITRON LTD.,
LIGHTING FITTING MANUFACTURERS
180 SHAFTESBURY AVE., W.C.2
COVent Gdn. 0126/7





From a photograph, with acknowledgements to Leo Computers Ltd. of 'Leo II.'

Electronic components

FOR ALL INDUSTRIES

(COMPUTERS)

Used in every form of mechanico-electrical accounting and computing equipment — and we illustrate one famous model — BULGIN Electronic Components are overcoming problems of control, as in all the Scientific and Industrial fields, giving faithful and reliable service. The Bulgin research department and manufacturing units, with their unique skill and experience, build good electronic components on which you can depend. Over 10,000 different components are now available.

★ ***For full details of Bulgin Components send for fully illustrated Catalogue No. 197/E.R. (free to trade letterhead or trade order)***

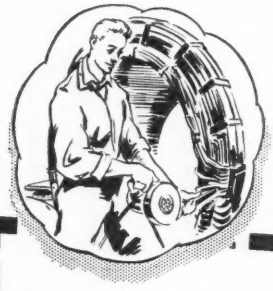
THE HOUSE OF

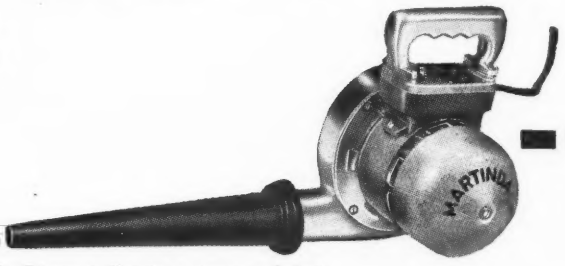
BULGIN

A. F. BULGIN & CO. LTD.
BARKING ESSEX
Tel.: RIPpleway 5588 (8 lines)

MANUFACTURERS OF RADIO AND ELECTRONIC COMPONENTS

The NEW MARTINDALE Portable BLOWERS



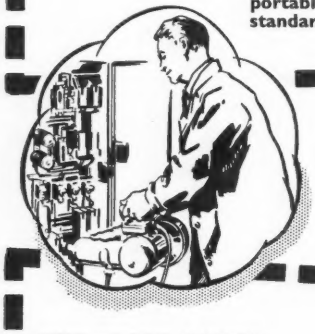


POWERFUL BLOWING

The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

EFFICIENT SUCTION

All of the five blowers are instantly converted into portable industrial suction cleaners by the use of standard attachments at little cost.



HOT AIR DRYING

An independent Heater is available for attachment to the Blowers, which produces hot air for the quick drying of coils, transformers and for many other purposes.

THE "PORT-A-VAC"

The "Port-A-Vac" light-weight harness permits the Martindale Blower to be used as a powerful vacuum cleaner carried in comfort upon the operator's back leaving him free to climb ladders, etc., to clean out-of-reach parts of the factory.

"MARTINET" WET-DRY SUCTION PICK UP

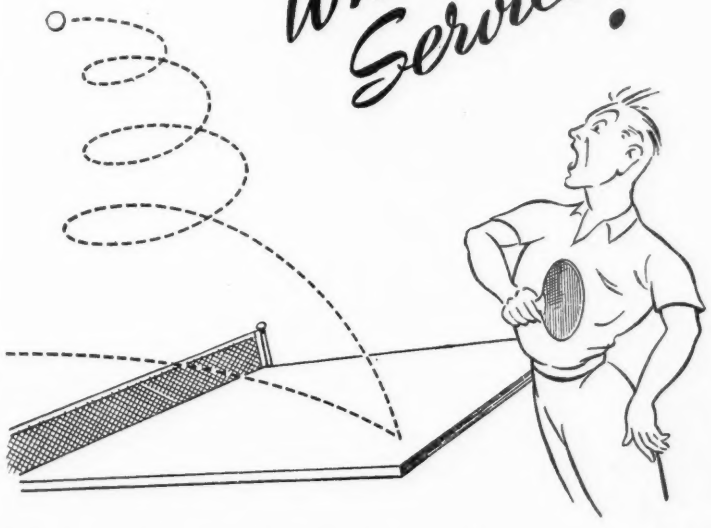
With this amazing equipment any Martindale Blower is converted into a suction cleaner which picks up both *liquids* and *solids*, the liquids and dirt being deposited into the special tank and only the airborne dust into the filter bag.

For full details of Specifications of Martindale Maintenance Equipment write to:—

MARTINDALE ELECTRIC CO. LIMITED

4 Westmorland Rd., London, N.W.9. COLindale 8642 also at 25 Elmbank St. GLASGOW C.2.

M.G.Y.



Purchase your

ELECTRICAL EQUIPMENT

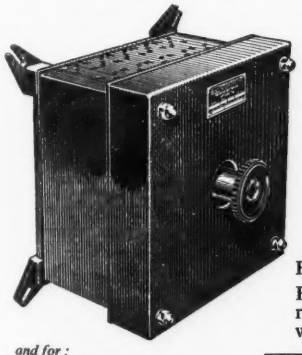
CABLE, CONDUIT
CONDUIT FITTINGS
ACCESSORIES
SWITCHGEAR
ELECTRIC TOOLS
RADIO, TELEVISION
HEATING APPLIANCES
INDUSTRIAL
COMMERCIAL
AND DOMESTIC
LIGHTING
EQUIPMENT

from the Wholesalers who have it in stock

Jamaica Row, Birmingham 5
Phone : MIDland 6714 (6 lines)
and at
Ford Street, Coventry
Phone 40501 and 2

RICH & PATTISON (B'ham) LTD.

Consult **Birch**
REGISTERED TRADE MARK
for
STUD TYPE RESISTORS



Stud type Regulating Resistors of front-of-board or back-of-board patterns. All resistors are fully tested for correct grading, insulation resistance and minimum high pressure test of 2,000 volts r.m.s. A.C. for one minute.
Write for list No. 120

VITREOUS ENAMELLED RESISTORS
Ferrule or wire end type : full range of 24 sizes — 1½—250 watts. List VE 190.

and for :
Asbestos Woven Mats
Heating Elements
Loading Resistors
Motor Operated Resistors
Sliding Resistors
Toroidal Resistors

Birch
REGISTERED TRADE MARK

H. A. BIRCH & CO. LTD.
WOOD STREET, WILLENHALL, STAFFORDSHIRE
Telephone WILLENHALL 494 · 495 · Grams WILOHM WILLENHALL
LONDON OFFICE : 1-5 NORTHOLT ROAD, HARROW, MIDDLESEX
Tel. : BYRON 5120

THIS IS THE TRADE MARK

FDS REGD

WHICH DENOTES THE BEST QUALITY IN

INSULATED WIRES AND STRIPS

F.D.SIMS LIMITED

P.O. Box 8 Hazelhurst Works
RAMSBOTTOM, Manchester
Telephone : Ramsbottom 2213/4/5
Telegrams : "SIMS, Ramsbottom"
London Office : 95 Westmoreland Rd., BROMLEY, Kent
Telephone : RAVensbourne 2805

547

TAKE YOUR PICK

Our wide range of capacitors, incorporating all the very latest developments, are described fully in these new leaflets . . .

SEND NOW for COPIES

DALY has succeeded in maintaining full capacity values and working voltages in more compact designs, specially suited to ultra-modern equipment:

PHOTO-FLASH EQUIPMENT • DEAF AIDS
PRIVATE TELEPHONE INSTALLATIONS
AMPLIFIERS • D.C. POWER UNITS
TRANSISTOR EQUIPMENT
MAGNETISATION EQUIPMENT
TEST GEAR

DALY
ELECTROLYTIC CAPACITORS

Condenser Specialists for over 20 years.

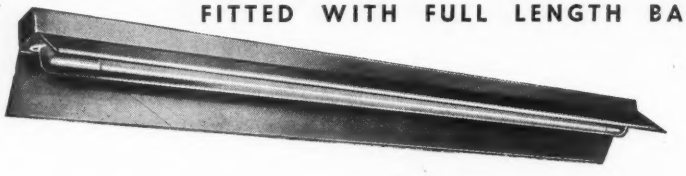
DALY *(Condensers)* **LTD.,** WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5. PHONE: EALING 3127-8-9. CABLES: DALCYON, LONDON

FOR BETTER LIGHTING

FLUORESCENT Wafax FITTINGS

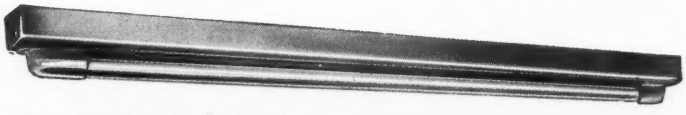
Obtainable in 5, 4 and 2 ft. Single and Twin Models

FITTED WITH FULL LENGTH BACKPLATES



5' OPEN ENDED TROUGH
with Quick Release Covers.
£4.12.10d. List Price
excluding tube.

5' BATTEN
with Quick Release Covers.
£4.0.0d. List Price
excluding tube.



SEND FOR CATALOGUE

WADES (HALIFAX) LTD. *Arden Works, Fenton Road, Halifax* TEL 61637

DORMAN

LOADMASTER

MINIATURE CIRCUIT BREAKER DOMESTIC CONSUMER UNITS

the modern method of circuit protection

- *No more fuse replacement*
- *Positive action*
- *Positive safety*

LOADMASTER—
FIT IT AND FORGET IT

POST COUPON FOR NEW LEAFLET

DORMAN & SMITH LTD

MANCHESTER Ordsal Electrical Works, Manchester 5 Tel: DEAnsgate 8822
LONDON 125 High Holborn, London W.C.1 Tel: CHAncery 6431
BIRMINGHAM 2/3 Graham Street, Birmingham 1 Tel: CENtral 2009
GLASGOW 249 St. Vincent Street, Glasgow C.2 Tel: CENtral 2479

CUT HERE

To: Dorman & Smith Ltd., Ordsal Electrical Works, Manchester 5

Please send me a copy of your latest Dorman Loadmaster Domestic Consumer Unit leaflet.

NAME .....

POSITION .....

FIRM & ADDRESS .....

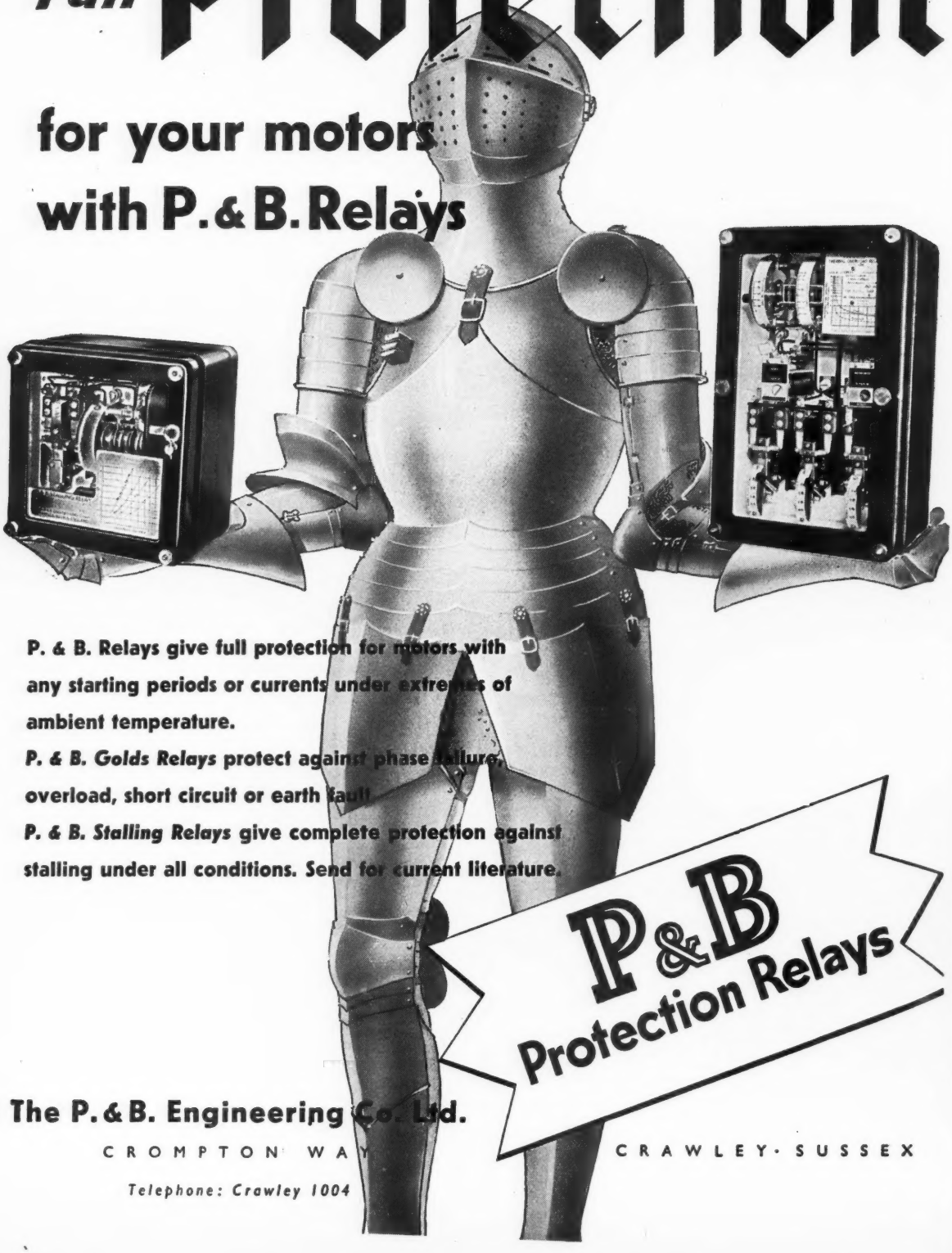
.....

.....

ER/12/57

Full Protection

for your motors with P.&B. Relays



P. & B. Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.

P. & B. Golds Relays **protect against phase failure, overload, short circuit or earth fault.**

P. & B. Stalling Relays **give complete protection against stalling under all conditions. Send for current literature.**

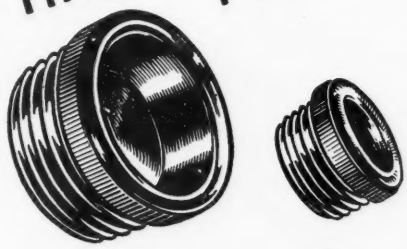
P&B Protection Relays

The P.&B. Engineering Co. Ltd.

CROMPTON WAY CRAWLEY · SUSSEX

Telephone: Crawley 1004

THREADED PLUGS



A wide range of sizes for Conduit and B.S.P. threads

Litholite Plastic Moulders since 1901

LITHOLITE Insulators & St. Albans MOULDINGS LTD.
Sandown Road, WATFORD, Herts. Tel. WATFORD 4494

Industrial plants need

Victor lighting

HOWEVER SPECIALISED your lighting requirements may be, they can be met from the extensive range of VICTOR lighting fittings. The many types available are fully described and illustrated in our catalogues L600 (weatherproof-flameproof) and L700 (non-flameproof), copies of which will be gladly sent on request.

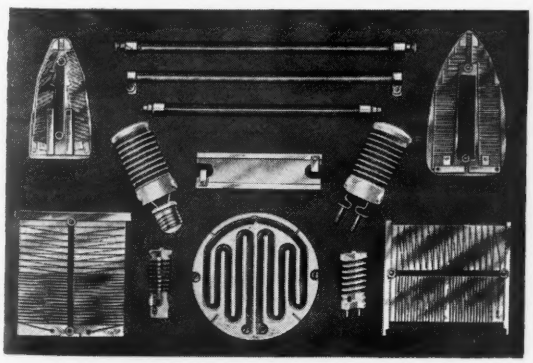
Free

On-the-spot advice of a VICTOR lighting expert is yours for the asking when planning new installations.

If its lighting—its Victor!

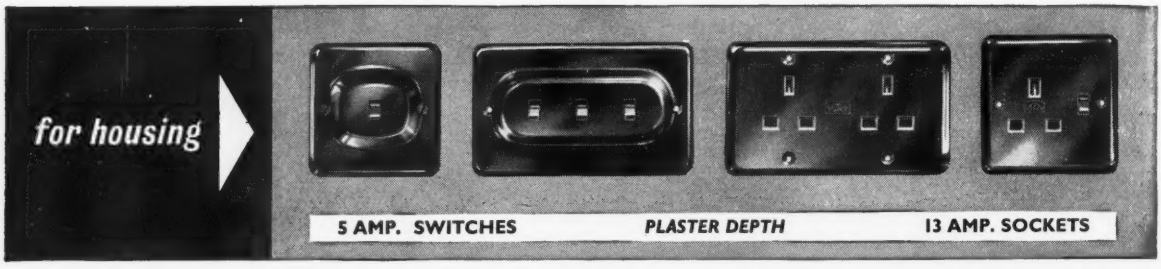
VICTOR PRODUCTS (Wallsend) LTD.
Wallsend-on-Tyne, England
Telephone: 68331 (6 lines) *Telegrams: "Victor" Wallsend*
LONDON OFFICE: 26 Millbank, S.W.1
Telephone: TATe Gallery 0033

dependable ELEMENTS
for every job
Stocked by Leading Wholesalers

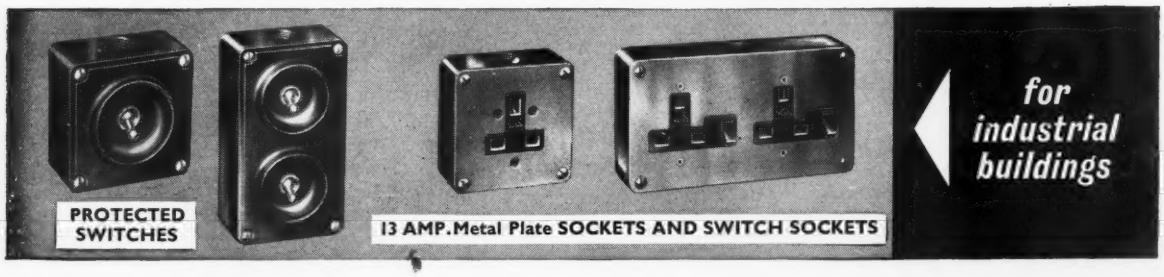


THE ELECTRIC ELEMENTS CO.
Tokenhouse Yard, Nottingham
Makers of Elements since 1921

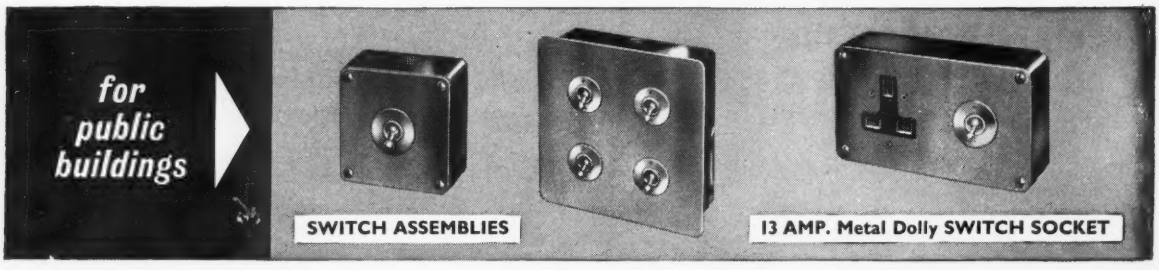
Volex makes the point...



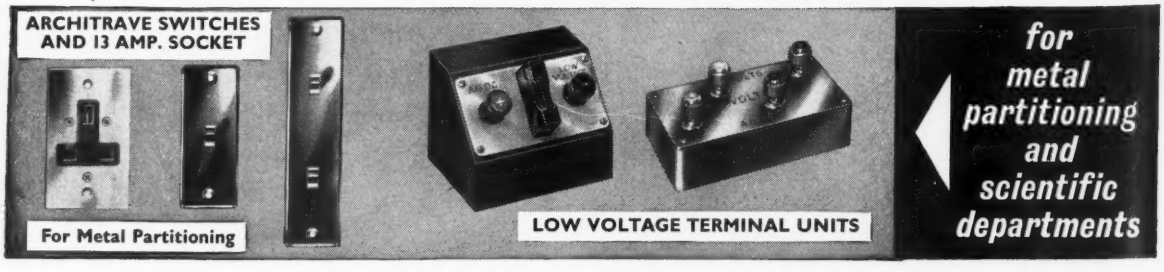
... used by Public Authorities and Government Bodies



... specified by Architects and Consultants



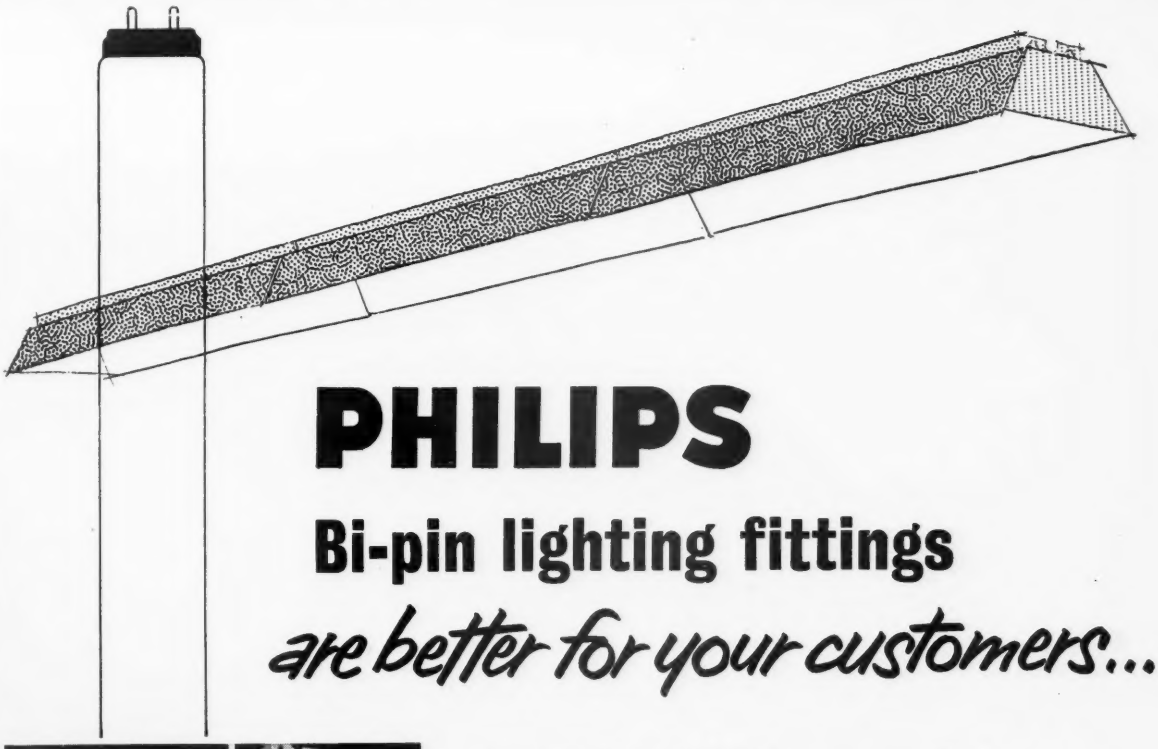
... approved by Contractors everywhere


ARCHITRAVE SWITCHES AND 13 AMP. SOCKET
For Metal Partitioning
LOW VOLTAGE TERMINAL UNITS
for metal partitioning and scientific departments

For further details send for 1957/58 Edition Catalogue.

VOLEX ELECTRICAL PRODUCTS LTD.
SALFORD 6

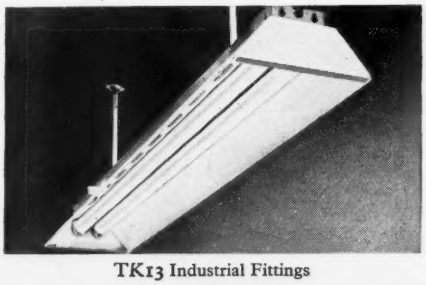
Telephone : PENDLETON 4373 Telegrams : VOLEXPROD. Salford 6



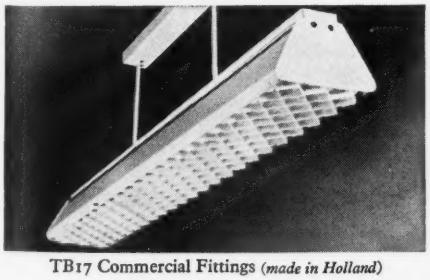
PHILIPS

Bi-pin lighting fittings

are better for your customers...



TK13 Industrial Fittings



TB17 Commercial Fittings *(made in Holland)*

Philips Bi-Pin Lighting Fittings are news. Here's why:

- ✳ They're simple, compact, light in weight.
- ✳ They incorporate the new Philips Polyester ballast, designed to deliver correct watts to the lamp, ensuring long life and maximum light output.
- ✳ They're ideal for both Industry and Commerce, and a wide range of fittings is available.
- ✳ They're standardised for 4′ and 5′ lamps to give a greater range of matching fittings.
- ✳ They can be arranged to provide a continuous stream of light.

...and for you!

Philips Bi-Pin Fittings are very important from your point of view too. And here's why:

- ✳ They're exceptionally compact for storage. With Bi-Pin *you can save storage space and reduce transport costs.*
- ✳ They're easy to install—so you save man-hours and increase profits that way too.

Order Philips Bi-Pin Fittings—available in 4 ft. or 5 ft. sizes—from your usual supplier or local Philips branch office. Expect demand to be considerable!

PHILIPS

PHILIPS ELECTRICAL LTD · LIGHTING DIVISION · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2
(LD3004)

KLÖCKNER MOELLER *Switchgear . . . .*

.... *in the Steel Company of Wales*

In September 1954, a Klöckner Moeller contactor was installed in the Cold Reduction plant of the Steel Company of Wales' Trostre works.
Now, some 3 years later, the contacts have 1.3 mm and 1.1 mm of wear remaining. The expected life of these contacts is a further 6 years.
In addition, during the entire working life of this equipment it has not been necessary to carry out any maintenance or repair.

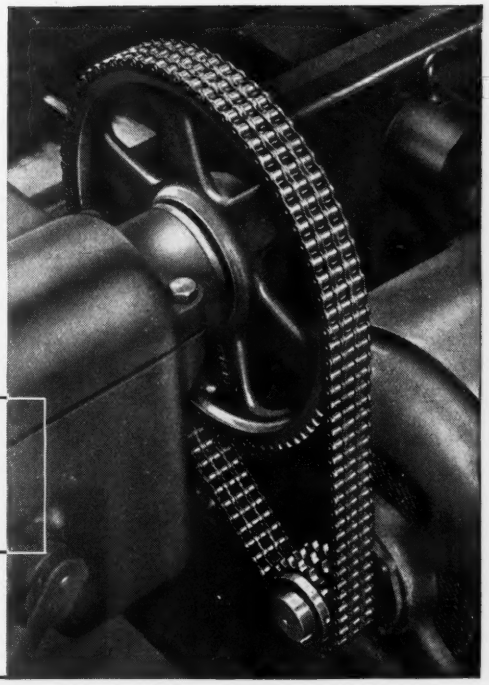
KLÖCKNER MOELLER ENGLAND LIMITED

LONDON 7 Charterhouse Buildings, Goswell Road, E.C.1. CLErkenwell 0778
BIRMINGHAM Guildhall Buildings, Navigation St., Birmingham 2. MIDland 2891
MANCHESTER Prince's Buildings, Block C, 28 Oxford Street, Manchester 1. Central 0274
GATESHEAD-ON-TYNE 451 Durham Road, Low Fell, Gateshead-on-Tyne 9. Tel. 75517

A LONG RUN FOR YOUR MONEY

For conversions or new equipment specify **RENOLD stock chain drives.** Quiet, positive and smooth running, they will give you years of dependable, trouble-free service, outlasting other types of transmission many times.

Drives from fractional to 140 h.p. can be supplied **FROM STOCK** in 25 different ratios, easily selected from chart in our Catalogue Ref. 116/93



RENOLD STOCK CHAIN DRIVES

Only 17 in. centres could be allowed for this drive from motor to heavy lathe — and only a Renold stock chain drive could transmit the necessary power at such short centres.

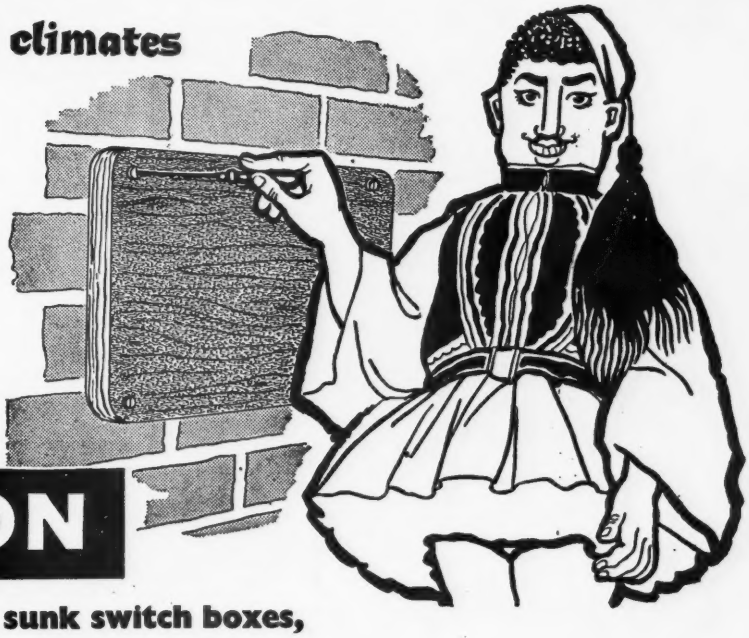
RENOLD—*the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

METER BOARDS all over the world

. . . . . and in all climates

You wanta best Meter Board ? The Greeks have a name for it : Wootton ! Our Parthenon was built to last—and Wootton Meter Boards are like dat—maka from best tested plywood.



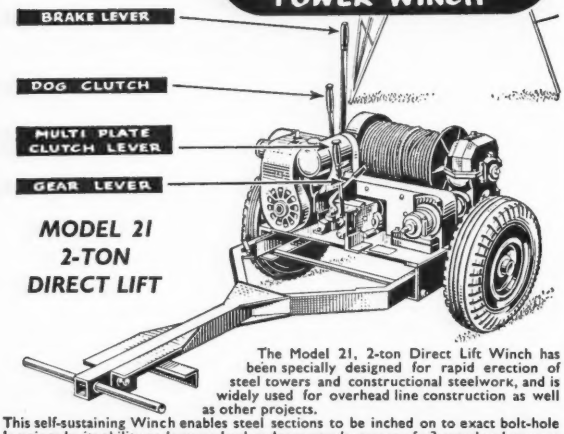
WOOTTON

wood blocks, sunk switch boxes, instrument cases

WOOTTON & CO. LTD • ALMA WORKS • PONDERS END • MIDDLESEX • *Tel. : Howard* 1858

STEEL TOWER ERECTION at LOWER COST!

The THOMPSON PORTABLE POWER WINCH



MODEL 21
2-TON
DIRECT LIFT

The Model 21, 2-ton Direct Lift Winch has been specially designed for rapid erection of steel towers and constructional steelwork, and is widely used for overhead line construction as well as other projects.

This self-sustaining Winch enables steel sections to be inched on to exact bolt-hole locations by its ability to lower a load under power by means of a 3-speed and reverse gearbox and clutch, thus effecting complete and accurate control of the load at all times. By use of this Winch construction costs can be considerably reduced. This portable, pneumatic tyred Winch is fitted with sprags fore and aft for anchoring to the ground, and can be supplied with either a petrol or diesel engine. Please write for full details.

Sole Manufacturers:
THOMPSON BROS. (ENGINEERS) LTD.
ARCHERY WORKS, ARCHERY ROAD, LONDON, S.E.9
Telephone: ELTham 3121

Amalgam RESINACT—
A supremely efficient solder

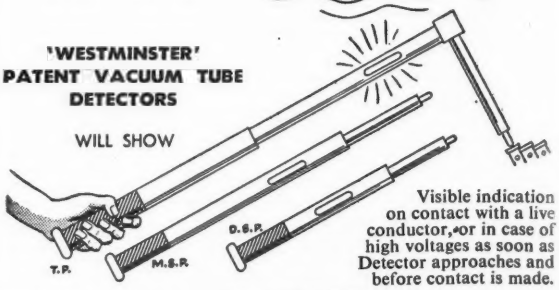
Write to us for a sample of this A.I.D. approved, activated solder wire with non-corrosive RESINACT core. It is specially designed for all electrical work and is available to any specification in sizes from 4-22 W.G.
We are specialists in all forms of fusible alloys.

GREY & MARTEN LTD
ESTABLISHED 1833
CITY LEAD WORKS · SOUTHWARK BRIDGE · S.E.1
Telephone: HOP 0414 Telegrams: Amalgam, Sedist, London
and at Birmingham and Ipswich

Is It Alive?

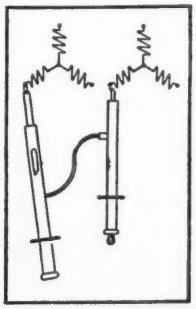
'WESTMINSTER' PATENT VACUUM TUBE DETECTORS

WILL SHOW

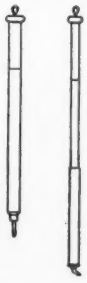


Visible indication on contact with a live conductor, or in case of high voltages as soon as Detector approaches and before contact is made.

Range 2,000 to 35,000 volts.



'WESTMINSTER' PHASING RODS
To locate interconnections between two A.C. systems.



'PARTRIDGE' PRESSURE DETECTORS
Give visible and audible indication of whether lines and contacts of draw-out switchgear are alive or dead.

NO EARTH CONNECTION REQUIRED

Write for full details to sole manufacturers:
The WESTMINSTER ENGINEERING Co. Ltd
(Dept. H.1) Victoria Road, Willesden Junction, London N.W.10
Tel. ELGar 7372 (2 lines)

TRUMETER
FOR MEASURING AND COUNTING
TRUMETER CO. LTD., MILLTOWN STREET, RADCLIFFE, LANCS
C.W.2689

CHAINS

To suspend all types of Fluorescent Tubes or Domestic Fittings. RIGHT type, finish and price! Years of experience — prompt delivery.

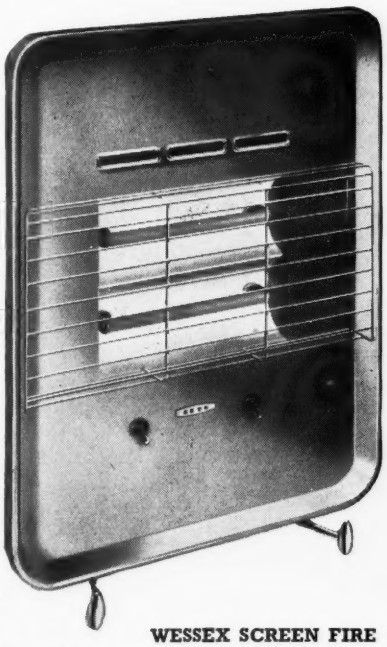
A. J. PRATT & SONS LTD.
Woodbridge Street, London, E.C.1
Telephone: CLErkenwell 3742/3

She loves a **good** fire...

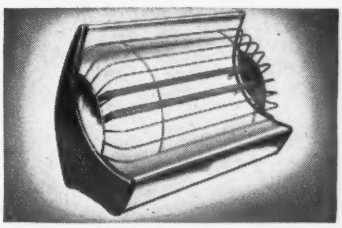
if it's a **REVO**

REVO Sales start at the drawing board! The designs illustrated are part of a range which has been evolved with one thought uppermost—*to make the strongest appeal to the widest variety of tastes.*
With their clean, functional lines, Revo Electric Fires will sell to every kind of customer. Only the highest grade materials are used, and the technical specification of each model conforms to the most stringent safety requirements.

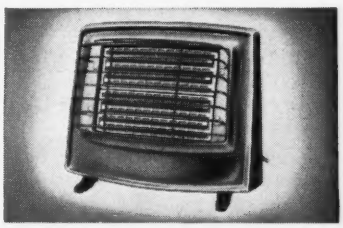
*** NATIONAL ADVERTISING GUARANTEES SALES**
Powerful, well-timed, full and half-page adverts in national magazines will create widespread demand for these Revo fires. Place orders now!



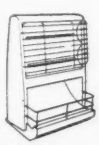
WESSEX SCREEN FIRE
An exciting example of the best in contemporary design. Functional too, because it completely screens the opening of an ordinary fireplace. Made in 2 sizes with adjustable feet and 2 k.w. pencil elements. Colours: Welsh Grey, Cotswold Stone, Pale Gold, Gay Red.

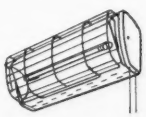


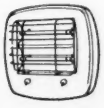
CRESCENT. Delightfully shaped model in enamelled sheet steel with electro-brightened anodised reflector, plated guard and pencil type elements 1 kw. or 2 kw. Colours: Welsh Grey, Cotswold Stone, Pale Gold, Gay Red.

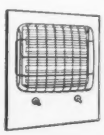


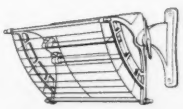
SOMERSET. A fire with superb finish and sound construction. Gleaming vitreous enamel finish with plated guard and block type elements. 1 k.w. or 2 k.w. Colours: Oyster Grey, Guardsman Red, Citron Yellow, Willow Green.


Glo-Ray

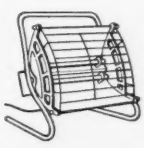

Swallow


New Outset


New Inset

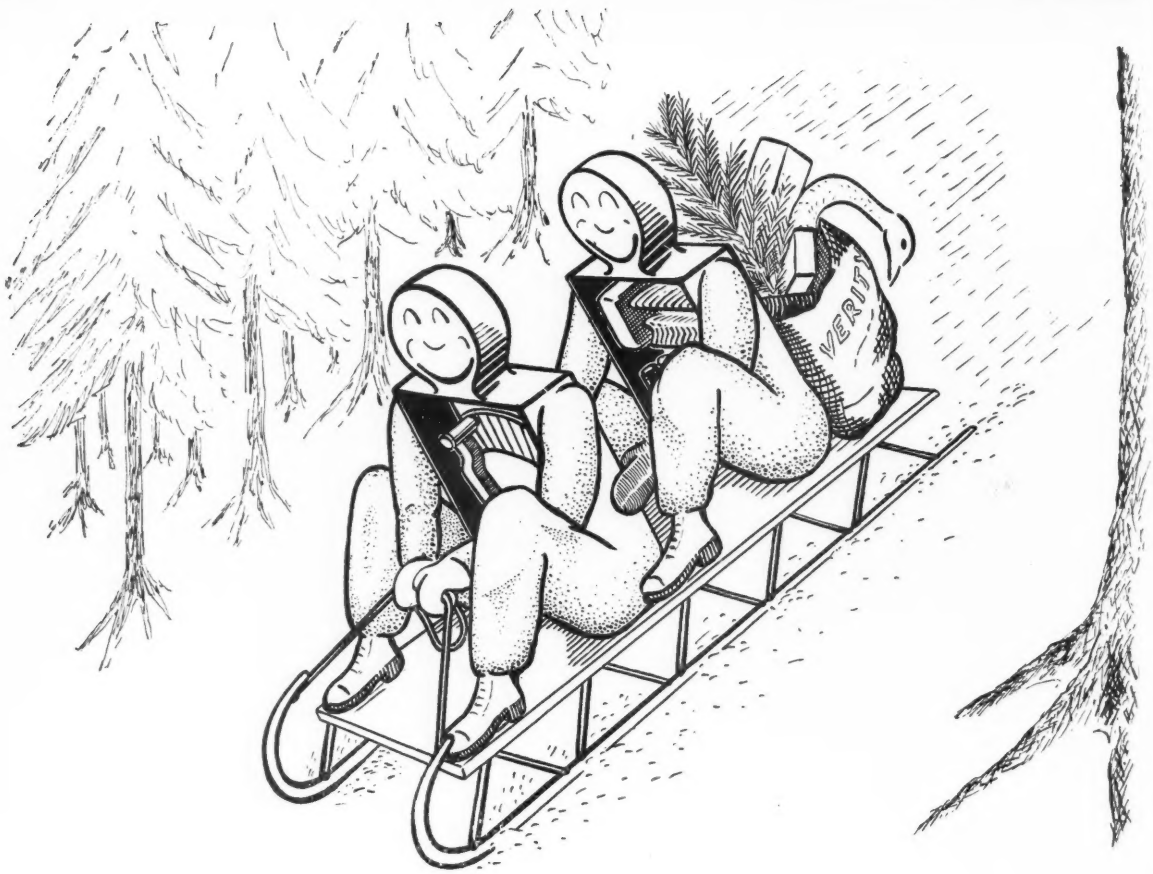

Reflexam

Convector


Tubula

It's time you knew all about REVO ELECTRIC FIRES

Write to REVO for full details of Electric Cookers, Kettles, Irons, the ROBOT Time Control Unit and the MAYFAIR Plate Warmer.
REVO ELECTRIC CO. LTD., TIPTON, STAFFS. *'PHONE: TIPTON 2828. 'GRAMS: REVO TIPTON*



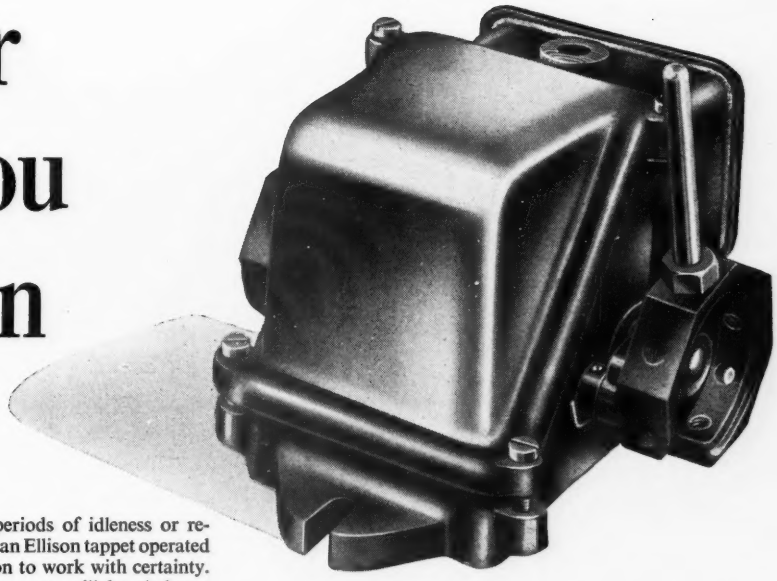
Mr. A. C. and Mr. D. C. having for three-quarters of a century been synonymous with the name of Veritys Ltd., join with the Directors, Staff and Workpeople in wishing all their many friends a Happy Yuletide and Good Business Throughout the Coming Year.

VERITYS LTD.

Sales Headquarters: PLUME STREET, ASTON, BIRMINGHAM 6
Branches: BIRMINGHAM - BRISTOL - GLASGOW - LEEDS - LONDON - LIVERPOOL - MANCHESTER
NEWCASTLE

Idle...

but never lets you down



Whether intended for long periods of idleness or required for frequent operation, an Ellison tappet operated limit switch can be relied upon to work with certainty. In that moment of emergency, you will be glad you fitted "Ellison".

Write for list No. 11 for details and illustrations of the Ellison range of limit switches and emergency trip switches.

ELLISON SHUNT LIMIT SWITCH (AC OR DC)

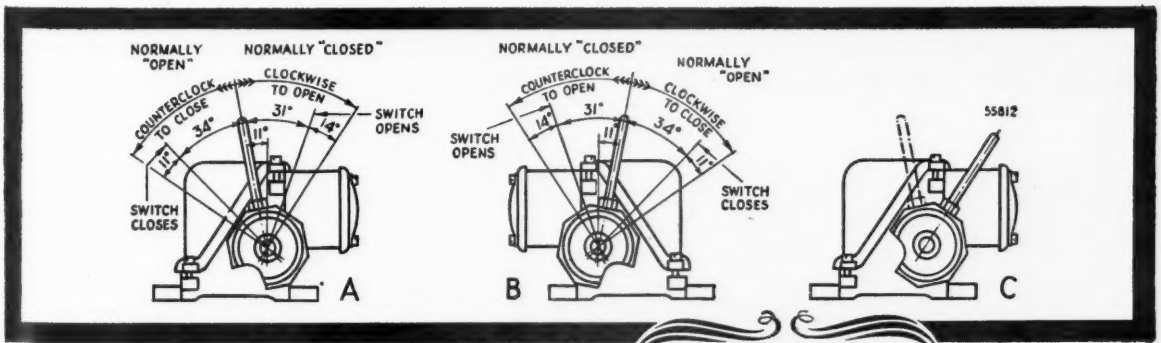
Maximum current carrying capacity of 40 amps continuously.

Breaking capacity at 440 volts of 10 amps non-inductive DC and 80 amps AC for single-pole and approximately three times these figures for double-pole. Available as Industrial, Watertight and Flameproof patterns.

ROTATION OF OPERATION OF SHUNT LIMIT SWITCHES

Sketches A and B show how the motion of a Shunt Limit Switch is reversed by turning the switch round and changing over the tappet to the other hub. Sketch C shows how a "normally closed" Shunt Limit Switch, with clockwise to "open" operation, is converted to "normally open", counter-clockwise to "close", by interchanging the springs and transferring the tappet to the position indicated by dotted lines. By turning the switch round as Sketch B, the operation can be converted to clockwise to "close".

The hub-springs of the Watertight and Flameproof Switches are inside the cases and it is necessary to substitute new springs when required to change from "normally closed" to "normally open".



YOU CAN RELY ON AN ELLISON PRODUCT

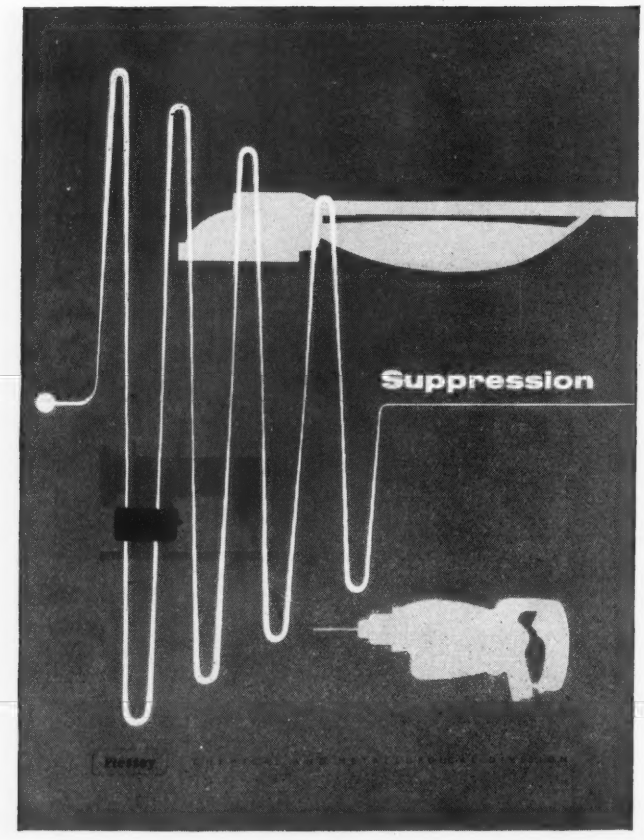
TRADE MARK
GEORGE ELLISON
LIMITED
BIRMINGHAM ENGLAND

762/G129

D

on the subject of suppression

This new Plessey publication is designed to assist all those currently concerned with the problems of suppression of all electrical equipment. The book provides Design Engineers with a standard reference to the complete range of suppressors produced by Plessey at Towcester, their individual suitabilities in application, their construction and their operational characteristics. Many illustrations and dimensional diagrams are included. Please ask for Plessey Publication No. 952.



Plessey

COMPONENTS GROUP
CHEMICAL AND METALLURGICAL DIVISION
THE PLESSEY COMPANY LIMITED
WOOD BURCOTE WAY
TOWCESTER, NORTHANTS
TEL: TOWCESTER 312

Overseas Sales Organisation:
PLESSEY INTERNATIONAL LIMITED
ILFORD ESSEX ENGLAND
TEL: ILFORD 3040

TC.1

13 DECEMBER 1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Electricity Reorganisation 1055

The Central Electricity Generating Board has set up a regional structure for its operation. This, and the parallel system of Engineering Project Offices, are commented upon

Modern Transformer Manufacture 1057

The construction of large power transformers has now grown into a heavy engineering industry and manufacturers have had to reorganise, rebuild and extend their premises to keep pace with modern requirements. The British Electric Transformer Co., Ltd., has just completed new facilities for the efficient flow production of all sizes of power transformers

Classification of Induction Motors by Torque Performance 1063

The custom of regarding starting current as a quantity to be restricted has so persisted that a choice between two motors would often rest on the relative starting currents. It should be recognised that per-unit values imply comparison between two distinct aspects of motor performance, the maximum torque related primarily to magnetic flux density and the h.p. rating of the motor, determined mainly on a heating basis

Stage and Television Lighting Control 1078

Both electro-mechanical and all-electric methods of remote control dimming are described, and switchboards by means of which one man can "weld" circuits and lanterns into an instrument of artistic expression

Colour Television "Flying-Spot" Film Scanner 1083

When colour television is established as a public service, film will be, initially, the most important programme source. The "flying spot" film scanner device described here has already proved successful in monochrome television and for colour work it offers a number of advantages in comparison with the alternative of using the three-colour camera and film projector

Combustion Engineering Conference 1087

Subjects discussed included instrumentation for combustion and process work and the design of gas-cooled graphite-moderated reactors

✧ ✧ ✧ ✧

New Books 1061
Magnetic Amplifiers and Transistors 1062
Views on the News 1067
Personal and Social 1068
Central Generating Board Appointments 1072
Industrial News 1074
Letters to the Editor 1079
Smithfield Show 1081
New Electrical Equipment 1091
Parliamentary Report 1093
Financial Section 1094
Generation and Development 1097
New Patents 1098
Contract Information 1099
Next Week's Events 1100
CLASSIFIED ADVERTISEMENTS 117
INDEX TO ADVERTISERS 128

VOLUME 161 NUMBER 24 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d: U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

Varicon Timer

PROCESS TIMING DEVICES

Everett Edgcumbe also manufacture Time Interval Meters and Hour Counters.

Adjustacon Timer

The full range of Everett Edgcumbe process timing devices covers practically every possible requirement in the field of process or operational control. Every device is based on the use of the "Synclock" self-starting synchronous motor thus providing precise time control and ensuring accurate synchronisation of two or more devices operating in conjunction. Combinations of similar or dissimilar types can be arranged to cover dependent but separate functions.

Several variations of each of the types illustrated are available and all are fully documented in a new descriptive catalogue sheet 611A, a copy of which will be sent on request.

Flexicon Timer

Rotacon Timer

There are many applications for timing devices where a user wishes to accommodate the operative unit in his own housing along with other apparatus. Rotacon units are particularly suited to meet this and can be supplied accordingly.

EVERETT EDGCUMBE & CO. LTD.

COLINDALE WORKS, LONDON, N.W.9. TELEPHONE: COLINDALE 6045

LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH, W.C.2. TELEPHONE: CHANCERY 5953/4

DHB/5641

ELECTRICAL REVIEW

13 December 1957 Vol. 161 No. 24 Established 1872

Electricity Reorganisation

THE new Central Electricity Generating Board has made public the new structure which it proposes to institute. Briefly the existing Generating Divisions are retained but they are to form five groups under "Regional Directors." It is intended that Regional Executive Committees shall take over accountancy and some administrative functions of the Divisions while the Divisions retain their technical duties. At the same time three "Engineering Project Offices" are being created to undertake the construction or extension of power stations.

As the Herbert Committee showed in its report, the Organisation Review Committee of the Central Electricity Authority had recommended the reduction of the number of Divisions to between five and seven. This, it was considered, would give a more even spread of the unequal loads carried by the existing Divisions. A start was actually made on this when the North Western and Merseyside & North Wales Divisions were merged in 1954 as a "pilot" scheme with a Management Committee, of which the Controller and his deputy were members. The Herbert Committee saw "little advantage in the interpolation of a regional management board between the Generation Board and the Divisional Controller on the lines of that established for the combined North West, Merseyside & North Wales Division," and considered that "Divisional Controllers should be able to assume responsibility for the duties assigned to them without the need of external support."

The Committee felt, however, that the Generation Board must be left free to work out in detail the precise form of regional organisation required. This the Board has now done. The ultimate extent of the powers which the Regional Executive Committees will exercise remains to be seen, but it looks as though with the handing over of some administrative work and the taking over of power station construction by the Engineering Project Offices the responsibilities of the Divisional Controllers will be greatly diminished. It is noteworthy that one of the new Regions consists of a single Division only—North West, Merseyside & North Wales, which suggests a future pattern of merged Divisions so that the establishment may consist of Regional organisations with the Project Offices as a parallel service, the Generating Board co-ordinating both, although giving them a fairly free hand.

However this may be, the Generating Board has announced that "it proposes to devolve more responsibility, autonomy and power to its provincial establishments." The existing organisation has done very well; it is to be hoped that the new arrangements will produce even better results.

BRITAIN AND EUROPE

So much has been written and spoken about the European Common Market and Free Trade Area that there is a danger of another publication on the subject, however good it may be, receiving less attention than it deserves. *Britain and Europe* is in fact a very good book which will repay the closest study. If the Government had prepared a "Blue Book" of their own it could hardly have contained a more complete and overwhelming case for British participation in the Free Trade Area. This time, however, the initiative has come from management and the unions, through the Britain and Europe Fund, and since the Economist Intelligence Unit were wisely given a free hand in the gathering of the information and writing of the text, the opinions expressed are independent.

Probably the most important aspect of this survey is the attempt made to forecast what the position will be in 1970 with the C.M. and F.T.A. both well established. Those sections of British industry likely to be adversely affected account for only 15 per cent of production, and electrical engineering (see page 1089) is among the leaders which will be "considerably stimulated." The worst handicap faced by this country is its low rate of investment and economic development, but a general benefit is to be expected from the quickening in the growth of national incomes and production that will follow the abolition of tariffs and quotas and from fairer competition.

THE E.T.U. DISPUTE

Events overtook us last week. After we had gone to press with our suggestion that the executive council of the Electrical Trades Union should make a statement about the differences between it and some of the Union's branches a statement was issued. This said, in effect, that while the executive council thought that the matter was nothing to do with the public it had been forced to repudiate "speculation, distortion and innuendo." It was insisted that the invalidation of votes cast in certain branches for candidates for council vacancies was warranted and by no means unusual. But even if the votes had been allowed the results would have been the same.

The statement leaves things much as they were and the executive council's critics are still unconvinced. Some of them are advocating intervention by the Trades Union Congress or even the Government, but both are reluctant to do anything. It may be thought that if the generality of members of the Union are dissatisfied with their executive council they should be able to muster enough valid votes to replace it when the occasion arises but, as members of the union explained on television, that is not so easy when the Executive Council holds all the cards and adapts the rules to suit its own purposes.

BOILER PLANT CLEANING

At the present stage of research development, while the necessity for frequent boiler cleaning in many installations may have been obviated, it remains true that an effective way of improving boiler availability is by complete cleaning of the heating surfaces of the plant down to the bare metal. This point is brought out forcibly by the illustration accompanying the announcement elsewhere in this issue of the new Bulletin MC286 of the Boiler Availability Committee.

Thorough cleaning of modern boiler plant is no easy matter, and it is believed that the suggestions contained in the Bulletin, which are based on the actual experience of station engineers and the technical staffs of the leading boiler makers and plant manufacturers, will help all those concerned with the cleaning of boiler plant. As in all similar activities, experience is invaluable, so that, when a method new to the operators concerned is to be tried, it cannot be too strongly urged that operators with experience in the method, and manufacturers, should be consulted.

CLEAN AIR

At the Milan conference last month of the World Health Organisation, representatives of 21 nations agreed that atmospheric pollution is the greatest and most urgent environmental evil in its effects on human, animal and plant life. Reports from some countries indicated a significant relationship between it and lung cancer and other diseases.

An important outcome of the conference was the setting up of a committee to study and report on the subject under the chairmanship of Dr. A. Parker (formerly of the D.S.I.R.). The committee will no doubt deal in its early stages with standardisation of nomenclature (a primary requisite in most international investigations) and with securing uniformity in sampling and measuring methods. Although increasing electrification will no doubt greatly mitigate the trouble, it will not be economically applicable in all cases everywhere.

ULTRASONIC INSPECTION

Vibrations as they occur in machines and structures have generally been regarded as a nuisance, costly to correct. In the 44th Thomas Hawksley Lecture, delivered before the Institution of Mechanical Engineers, Professor J. P. den Hartog referred to an instance in which vibrations are likely to prove of increasing benefit to industry. That is in the use of ultrasonic waves (at over 10,000 c/s), usually produced by electronic techniques, for detecting cracks or flaws in metal, particularly in welded joints. A noise generator, due to L. Bergson (1954), passing over a sudden change in thickness of the metal or over an interior crack or non-metallic inclusion gives an indication on the meter. Professor Hartog considers that the use of this method will increase as a serious competitor to X-rays.

WASHING MACHINES

Next week's issue (20th December) will contain an illustrated survey of domestic washing machines giving particulars in tabular form of type, size, tub capacity, loading, method of agitation, finish, price, etc. The following survey (10th January issue) will deal with wash boilers.

View of core building and erection bays devoted to small and medium transformers

MODERN TRANSFORMER MANUFACTURE

Examples of Reorganisation to Raise Production Efficiency

DURING the past ten years the construction of large power transformers has grown into what is essentially a heavy engineering industry. Before the war it was exceptional for a transformer to weigh more than 100 tons, whereas nowadays units are frequently built which weigh upwards of 260 tons. Obviously, such bulky equipment has presented some difficult handling problems, to mention just one aspect of production, and transformer manufacturers generally have had to reorganise, rebuild or extend their premises to keep pace with modern requirements.

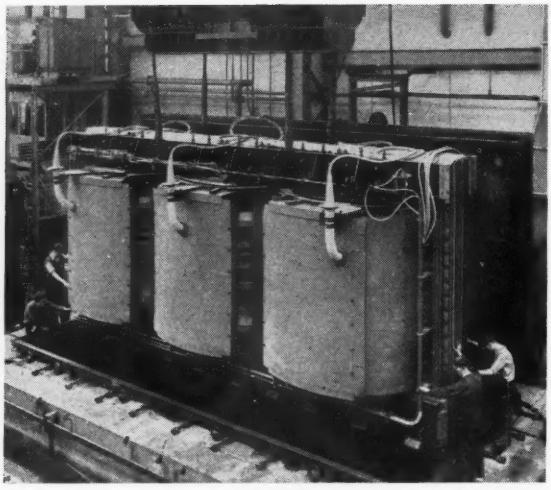
At the Hayes, Middlesex, works of the Crompton Parkinson, Ltd., associated company, the British Electric Transformer Co., Ltd., transformers are made with ratings from about 5 kVA up to a figure which is limited only by transport facilities. Here, new facilities for the construction and testing of the largest transformers have been completed as part of a major development scheme embracing the whole works. Handling facilities, production lines and equipment, stores facilities, test plant; the offices, canteens, cloakrooms; everything in the works without exception has been considered and, where necessary, brought up to a standard of efficiency and orderliness commensurate with modern conceptions of the ideal transformer manufacturing unit.

The works site is roughly triangular, bounded by the Grand Union Canal, a roadway and an adjoining factory. Expansion beyond these limits was impossible so the maximum use has been made of all building space.

A new roadway has been constructed around the works which permits delivery and off-loading of materials and components at the most advantageous points on the perimeter. This contributes usefully to flow production, the attainment of which throughout the works has been an underlying principle of the development scheme as a whole. The roadway combines with a direct rail connection between the works and the Western Region of British Railways to provide transport facilities for incoming goods and outgoing products in general.

Considering the actual works development, and taking

Copper covering bay showing machines used for wrapping paper, and where required cotton, insulation on copper strips. All paper insulation is carried out by the "half lap" process



120 MVA, 275/66 kV transformer being lowered into vacuum oven

the various sections in production sequence order, the insulation and winding shops occupy the north-western corner of the works. For obvious reasons these shops, together with the stores for associated raw materials, are entirely separate and removed from all metalworking or similar process work.

For oil-cooled transformers materials such as manila paper for conductor covering and high-grade pressboard for cylinders, wraps, washers, inter-coil and inter-winding spacers are employed. In the case of Class H high-temperature transformers the more recently-developed synthetic insulating materials are used to permit high working temperatures in the cores and windings.

All plant in the insulation shop has been brought up to date, power presses, for example, being used for the production of the many shapes and sizes of inter-coil insulation spacers. Also of note here are the machines used for applying the paper or cotton insulation to the conductors. These incorporate arrangements whereby bare copper strip is thoroughly cleaned immediately before the insulating lappings are applied.

To facilitate flow production, the three bays which comprise the winding shop are each equipped for the production of particular ranges of windings. One bay has been equipped with machines capable of producing h.v. cross-over coils wound with wire or small strip, while another bay is devoted to the production of h.v. and l.v. unit windings of up to about 15 MVA. The third bay has been equipped for the production of the largest windings. All three bays in the winding shop are served by electrically operated cranes of appropriate lifting capacities.

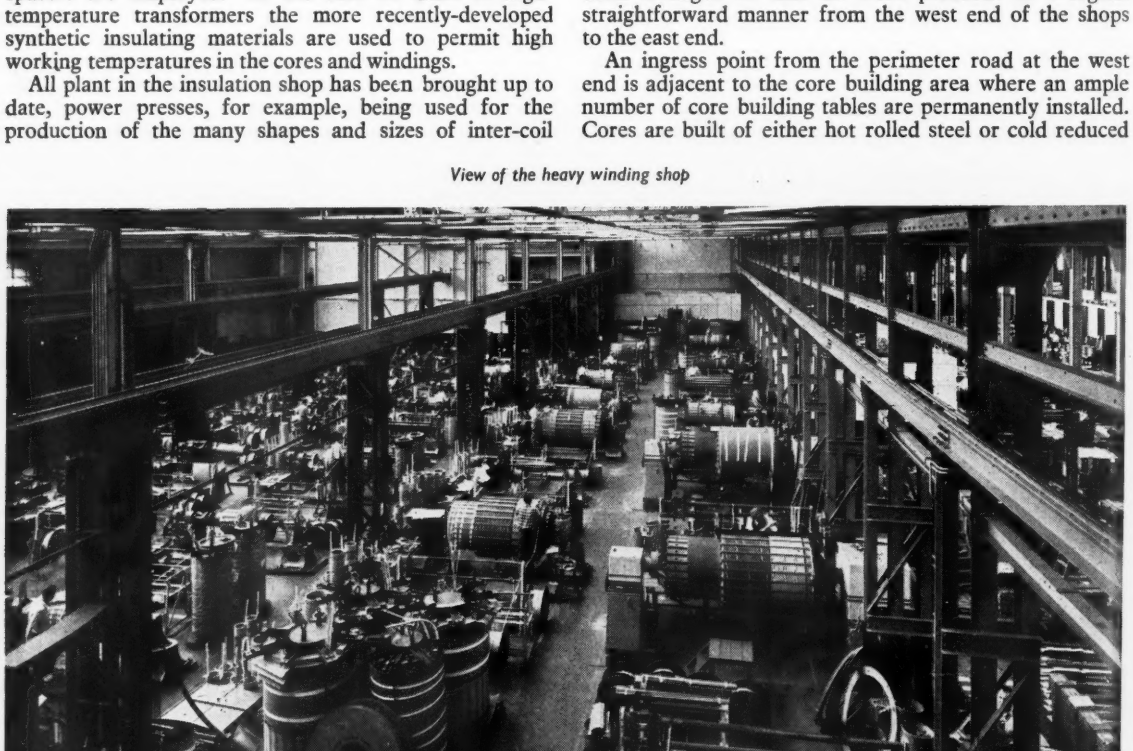
The production of transformer windings is an intricate and highly specialised process and the company has long considered it preferable to use its experience of the problems involved by designing and building its own winding machines. Apart from some of the equipment in the light winding section all of the winding machines now in use at the works are of the company's own manufacture. All machines are individually motor driven and throughout the works any line shafting that remained at the end of the war has been scrapped.

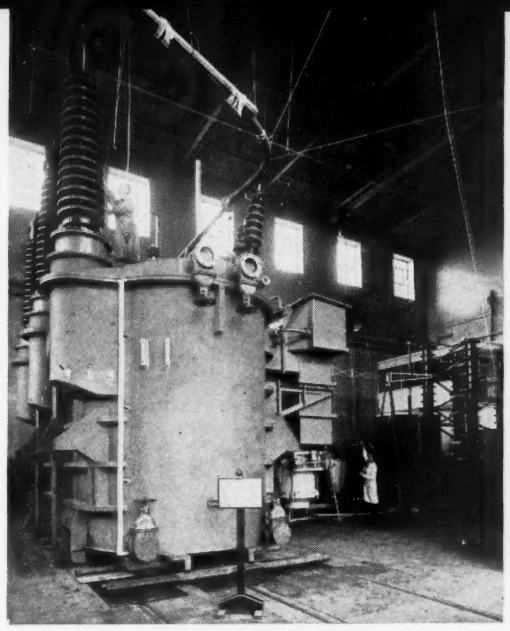
Assembly and Erection

To facilitate flow production, the assembly and erection of transformers has been divided into two separate sections on a transformer size basis. Units of up to about 1,500 kVA are built in two reconstructed bays where the stores facilities, production and testing plant, etc., have been arranged so that all work proceeds in a logical straightforward manner from the west end of the shops to the east end.

An ingress point from the perimeter road at the west end is adjacent to the core building area where an ample number of core building tables are permanently installed. Cores are built of either hot rolled steel or cold reduced

View of the heavy winding shop





120 MVA transformer for the supergrid undergoing impulse tests in the high voltage laboratory

grain oriented steel laminations as required by the customer.

Next in order are the areas in which assembly and erection are conducted. Here, two modern vacuum ovens have been installed (one in each bay) for drying out the transformers. Adjacent to these are the tanking sections and the test area. It should be noted that a high proportion of the transformer tanks are fabricated in the company's Southall works about two miles away. Then come the areas where "finishing-off," painting and, when necessary, packing are carried out, and finally, the egress point at the eastern end of the two bays.

All transformers above 1,500 kVA are built in the large erection shop, which has been reconstructed and newly equipped with cranes and other handling plant having adequate capacity for the largest transformers likely to be required in the foreseeable future. In this shop, the ingress point and the stillage area utilised for incoming core laminations are at the eastern end. Adjacent to the stillage area are the large core building tables, and immediately on the north flank of these are the assembly, erection and tanking areas. A test platform has been installed on the south side of the shop overlooking the complete working area. Included in the equipment is a modern drying oven which employs hot air circulation and a high-temperature vacuum system, and closely associated with this equipment is an oil processing plant of the latest design.

The test section has been completely modernised and re-equipped to cater for the testing of the largest units likely to be manufactured. Among the latest equipment to be installed are two 15 MVA, three-phase, 50 c/s, 11 kV motor-alternator sets, together with an associated 30 MVA, three-phase interposing transformer to facilitate voltage variation.

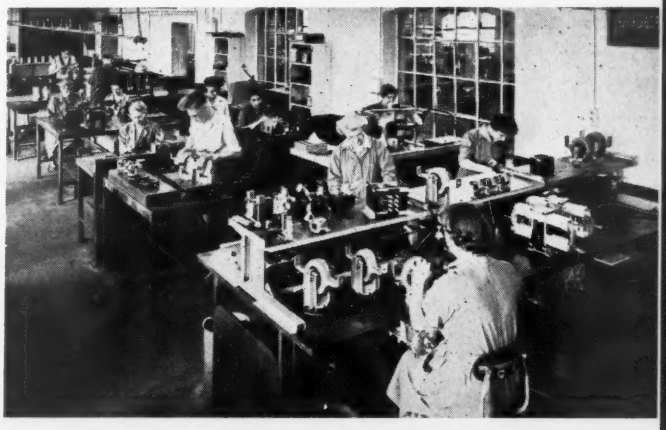
Machine Shop

Another aspect of the reorganisation has been the modernisation of the machine shop, the resources of which are employed for a wide variety of work, as is the case in any large factory. A special function of the machine shop at Hayes, however, is the production of most of the components required for on-load tap-changing gear. As well as necessitating the purchase of new machines, the reorganisation scheme involved the removal of this section from one part of the works to another to facilitate the direct passage of medium-sized transformers from the erection shops to the dispatch area.

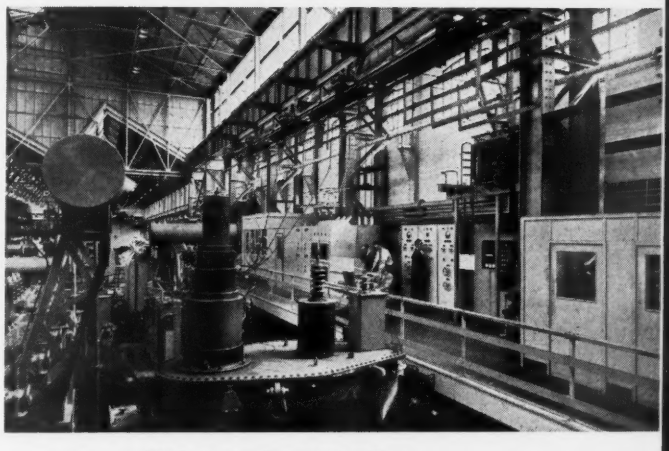
Impulse Testing Laboratory

An e.h.v. laboratory has been set up as an establishment quite separate from the normal testing equipment. It is adjacent to the large transformer shop from which access is gained by a very large motor operated roller shutter. Initially, this laboratory has been equipped with a 2 MV multi-stage impulse generator which can be readily modified to produce 3·5 MV. There are also two h.v. transformers connected in cascade to provide 750 kV r.m.s. at 50 c/s, and provision has been made to supplement these with a third transformer in cascade to bring the total voltage up to 1,125 kV r.m.s. at 50 c/s.

The laboratory had to be a large building in order to house three-phase double-wound transformers of some 350 MVA at voltages up to 275 kV and also possibly three-phase auto-transformers of some 400 to 500 MVA for voltage ratios of 400/275 kV. At the same time it had to accommodate the impulse generator and 50 c/s h.v. transformers and provide for the large clearances that are required for super-voltage testing. The building is 100ft long by 50ft wide and 60ft to the roof. It is arranged with a gallery at one end, housing the control panels for the impulse generator and for the 50 c/s h.v.



Section of the instrument transformer shop



The large transformer test gallery

testing transformers. It also accommodates the oscillograph or transient recorder room, and a dark room.

The oscillographs are of the sealed tube cathode-ray type, separate instruments being provided for surge voltage and surge current records. A spare instrument is available capable of fulfilling either of these functions. The impulse generator consists of four columns and has a total of twelve condenser stages. The charging set is of the hard valve double-wave rectifier type and produces 175 kV d.c. for charging the generator. The stages of the generator are, of course, all charged in parallel at voltages up to 175 kV and are discharged either in series or in series-parallel arrangements, giving 2,000, 1,000, 500 or 175 kV, depending upon stage connections. The impulse generator is calibrated for each series of tests against the known breakdown voltage of one metre diameter spheres, corrected for barometric pressure and temperature.

The laboratory is equipped with a recurrent surge oscillograph which is capable of producing 1/50 μsec waves, 0·1/50 μsec waves, and also waves that can be chopped at varying times from the peak value. Provision is also made for simulating the condition that arises in large h.v. transformers when, with the secondary load removed, the h.v. primary winding is disconnected from the supply by high-speed air-blast circuit-breakers. Under these conditions relatively high voltages can be generated within the transformer windings when the magnetising current is "chopped" at its peak value. The oscillograph is capable of producing and measuring these conditions. Another facility provided is an insulated tank made of synthetic resin bonded paper which is 5ft in diameter and 10ft high. This is filled with oil and used for testing component parts such as inter-coil insulation arrangements and on-load and off-circuit tapping switch assemblies. The tank is provided with heaters in its base which enables 50 c/s or impulse tests to be carried out on such sub-assemblies in oil, either at room temperature or any desired oil temperature.

A large number of design proving tests are carried out in this tank on winding and switch sub-assemblies following the establishment of the impulse voltages appearing across components as shown by recurrent surge oscillograph tests on complete transformers. Thus the company knows what impulse voltages appear in the various parts of its transformers; it tests the ability of the component parts of windings and switches to withstand these impulse voltages, and also destructively tests the component parts with higher impulse voltages to prove the establishment of a satisfactory safety margin beyond the required impulse level. All this approach work is satisfactorily completed long before carrying out the impulse withstand tests on completed transformer types, and the company tends to regard the witnessed impulse tests as a final contractual formality when viewed against the detailed investigations that have preceded it.

LORD KELVIN

From a Correspondent

NEXT Tuesday, 17th December, is the fiftieth anniversary of the death of William Thomson, Lord Kelvin. He was born in Belfast in 1824 and achieved early academic distinction. At the age of 22 he was elected to the Chair of Natural Philosophy in Glasgow University. There he established Britain's first physical laboratory.

An important event in his early life was his meeting, in Manchester, with Joule, then seeking to demonstrate the identity of heat and energy. Thomson supported Joule's theory that work and heat were mutually convertible, and for about seven years made investigations along similar lines. Early in 1853 he read a paper to the Glasgow Philosophical Society entitled "Transient Electric Currents," in which he discussed, in mathematical terms, the discharge of a Leyden jar through circuits having both self-inductance and resistance. Out of these investigations sprang the theory of electric oscillations which, after further work by Hertz and Lodge, formed the basis of radio-telegraphy.

In 1854, in the *Proceedings* of the Royal Society, there appeared Thomson's paper "On the Theory of the Electric Telegraph," which dealt with certain problems associated with the use of long-distance cables. Submarine telegraphy was, just then, entering the sphere of commercial practicability. A cable between England and France was actually laid in 1851 and one between Holyhead and Howth in 1853, and other projects were in hand. When, in 1856, the Atlantic Telegraph Company was formed Thomson became one of the directors.

The first attempt to lay an Atlantic cable, in 1857, resulted in failure. But Thomson's discovery that the conductivity of copper was affected by its purity led to the manufacture of better cables, and in 1858 the s.s. *Agamemnon* successfully linked the Old and New Worlds together. Unfortunately, after only a few messages had been transmitted, the insulation of the cable broke down—due to the use, against Thomson's advice, of induction coils working at high voltage. However, in 1866 another cable was laid. On returning to England after this triumph, Thomson was knighted. He went on, in 1867, to patent the siphon recorder, and from that date there were few submarine cable projects in which he was not consulted.

The application of science to practical ends was one of Thomson's constant preoccupations. He kept closely in touch with scientific developments in several fields. He watched, for example, the early experiments with electric lighting. In 1881 he suggested harnessing Niagara Falls for the generation of electricity. A quarter of a century later he read Rutherford's famous work on *Radioactivity*, and displayed a lively interest in that new conception—the "electron."

Lord Kelvin (he was elevated to the peerage as Baron Kelvin of Largs in 1892) included among his inventions electrometers, galvanometers, siphon recorders, mariners' compasses, sounding apparatus, and machines for tide prediction. When his company, Kelvin & White, was formed to manufacture these instruments he became most absorbed in its affairs, and visited the factory daily.

Kelvin was president of the Institution of Electrical Engineers in 1874 and again in 1907; he died before he could deliver his second presidential address. He was president of the Royal Society from 1890 to 1895. When he was buried in Westminster Abbey scientists from all over the world were present to pay a last tribute to one of the leading physicists of his day.

NEW BOOKS

Arcs in Inert Atmospheres and Vacuum. Edited by W. E. Kuhn. Pp. 188; figs. John Wiley & Sons, Inc., New York. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 60s.

This book contains papers presented at a symposium of the Electrochemical Society, held in San Francisco in the spring of 1956. It is mainly concerned with characteristics of high current arcs in vapour produced by electrode evaporation or chemical processes occurring in the arc chamber.

Most of the investigations described were designed to give information that can be applied to "cold crucible" arc furnaces, which are coming into increasing use for melting reactive and refractory metals. An important feature of the process is the purification of the metal due to the vacuum or inert atmosphere, and the increasing demand for purer metals is resulting in this technique being extended to many familiar metals and alloys such as high quality steels.

In the first part entitled "Arc Melting Fundamentals," a number of investigations are described which deal with many of the variables involved, e.g. information is given on such matters as rates of electrode consumption and transfer of energy to the anode. In the next section a number of arc melting furnaces are described and their design and operation are discussed. This includes recent German developments. The last section is concerned with the high intensity arc, e.g. there is some discussion of a new application in chemical or metallurgical processes where vapours of a very wide range of materials may be produced at extremely high temperatures by incorporating in an electrode a large percentage of the material, which may be a non-conductor. There is some theoretical study of processes near the anode.

There are a number of fields in which there is interest in gathering as much information as possible on arcs, so that this book may offer some useful information outside the development of arc melting processes, although it will be most valuable to workers in this subject.—A.E.G.

Electrical Discharges in Gases. By F. M. Penning. Pp. 78; figs. Philips' Technical Library book. Cleaver-Hume Press, Ltd., 31, Wright's Lane, Kensington, London, W.8. Price 15s.

The author of this book was well known for his work on gas discharges over a period of 30 years in the Philips Research Laboratory at Eindhoven. The first part of the book is concerned with non-self-sustaining discharges and deals with such matters as liberation of electrons by radiation, space charge limitation, elastic and inelastic collisions; leading up to self-sustaining discharges, the Townsend discharge and Paschen's Law are discussed, followed by sparks, lightning, glow discharge, arcs and the positive column.

This book is not intended for those working in this field, but is rather for those engineers who for general interest would like to know something of the basis of the subject, or who work in an allied field and have contact with workers in the subject. It is of a length and clarity to make it very readable for such engineers, and for students who may touch on the subject towards the end of their course. However, some care should be exercised by the reader, because in any short and easily read account it is inevitable that depth of treatment must be sacrificed, and some matters are over-simplified and made to appear to have been more fully investigated than is really the case. An example of this is that the chapter on arcs is too brief to be very useful and the uncertainties concerning cathode emission are not apparent. Some points are dealt with in a slightly different way from most English and American books, e.g. instead of Townsend's α, the ionisation coefficient used is η which is the average number of ionising collisions made by an electron for each volt potential difference fallen through. There are one or two misprints in values given (e.g. on pages 5 and 7). The treatment is mainly qualitative and where expressions are given for quantities, the derivations cannot be expected in a book of this size, but it is a pity that more references were not given at these points so that derivations could easily be located.—A.E.G.

Switchgear Principles. By P. H. G. Crane. Pp. 238; figs. Cleaver-Hume Press, Ltd. Price 25s.

The publishers' note describes this book as a concise survey of the problems of circuit-breaking for which there is a real need, and recommends it for technical college students and juniors in the industry. The subject of switchgear, however, is extensively covered in technical literature both in the basic and advanced stages and it is difficult to agree that this addition has anything serious to add or gathers together in a better way the existing body of knowledge.

The author would have been wise to have pruned away much of the very elementary information given, which is presented better in the context of a general work on electrical technology, and concentrated on a more closely knit description of switchgear theory and how it is put into practice in actual circuit-breakers.

Most engineers would challenge many of the assumptions which a student might make from the book. The suggestion that fault currents on h.v. systems over 3·3 kV are dealt with almost exclusively by circuit-breakers is quite wrong when applied to overhead distribution where fuses are extensively used up to 33 kV; and the recloser, recently put into production in this country and much used in the U.S.A., justifies more than a single paragraph. To imply, as is done, that 3·3 kV is a typical distribution voltage suggests a lack of acquaintance with modern practice.

The book is well produced, attractively priced as these things go nowadays, and the illustrations are clear and well drawn; but the author will need to make drastic revisions if his true purpose is to be achieved.—H.R.M.

BOOKS RECEIVED

Radio Upkeep and Repairs. 8th Ed. By Alfred T. Witts, A.M.I.E.E. Pp. 234; figs. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 15s.

Electricity in Building. By A. L. Osborne, F.R.I.B.A. Pp. 160; figs. B. T. Batsford, Ltd., 4, Fitzharding Street, Portman Square, London, W.1. Price 25s.

Newnes Electrical Pocket Book. 14th Edition. Edited by E. Molloy. Pp. 384; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 10s 6d.

Technology for Sugar Refinery Workers. 3rd Ed. By Oliver Lyle. Pp. 663; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 70s.

Selection and Application of Metal Rectifiers. By Stuart P. Jackson. Pp. 326; figs. McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95, Farringdon Street, London, E.C.4. Price 60s.

Magnetic Amplifiers and Transistors

Discussion on I.E.E. Papers

THE discussion on the group of papers dealing with magnetic amplifiers and transistors, which was read at the Institution of Electrical Engineers in London last week (see *Electrical Review*, 6th December, page 1043), was opened by Mr. I. Wilson (A.E.R.E., Harwell). Referring to d.c. amplifiers and chopper d.c. amplifiers, he said that the scheme proposed by the authors looked attractive for use in analogue computers of the sort that used a large number of high-gain d.c. amplifiers and usually worked on single-phase or real-time working. Drift and bandwidth would, however, need to be reconsidered. He wished the authors had been able to deal more fully with the use of the transistor as a switch with emitter load currents. They bottomed well, even with high emitter current. He could see considerable use for transistor switches, making use of quasi-digital techniques for doing multiplication and function generation, and the weakest components in any system seemed to be the multipliers and generators, the non-linear components.

Mr. F. Oakes (Ferguson Radio) said that the two papers on d.c. amplifiers provided solutions for a number of problems limiting the performance of d.c. transistor choppers, which for some time had promised a good means of tackling d.c. amplification. Dr. Chaplin had said that the main drawbacks of the d.c. amplifier were the need for careful matching and the somewhat cumbersome setting up procedure, but colleagues of his had succeeded in rendering the latter quite easy. The selection and balancing problems were not insurmountable, therefore, although there were hidden snags in sophisticating balanced amplifiers.

Mr. L. C. Burnett (Ericsson Telephones) drew attention to the existence of a British Standard symbol for a dekatron. He denied what he described as " the Harwell fairy tale " that the dekatron was no good unless it had a guide pulse drive, and pointed out that the indicator pulse drive which used much fewer components was just as good from the life test and circuit points of view, though the low impedance might not be satisfactory to the blocking oscillator circuit.

Half-Wave Magnetic Amplifiers

Dr. E. H. Frost-Smith (Staveley Coal & Iron Co.), referring to the paper on half-wave magnetic amplifiers, said he did not think it correct to say that transients in the control circuit might be ignored. Three essential times had to be considered and the mean control current could only be obtained by considering all three and dividing by the total. He did not see how Mr. Ettinger reconciled the statement that the main control current was given by the control voltage divided by the control circuit resistance with the fact that he had only considered one-half of the total period of flow of current.

Mr. F. Holmes (Hilger & Watts) asked whether Dr. Chaplin had any remarks to make on the application of his transistorised counter and whether it would be possible to put in a supervisory signal in parallel to, say, four dekatrons into the transformer itself by having an additional winding and arranging the waveform so that control was left to the supervisory signal. This would permit of the use of a single parallel read-out register, either indicating or printing.

Dr. J. E. Flood remarked that the work on transistor-driven dekatrons was significant because it enabled the dekatron to be used not only as a simple scaler but in fairly complicated logical circuits, such as were used for control purposes in digital computers. An output could be obtained from a dekatron which would operate transistor logic and the transistor logic would trigger the driving oscillator.

Mr. J. S. Walker (Texas Instruments) said it was interesting that the human eye, if gazing on a scene that was not fluctuating in pattern or intensity, executed very small movements that converted signals received effectively. This technique that had been with them for so long had only recently been discovered in the d.c. chopper amplifier.

Mr. J. K. Webb (Standard Telephones) said he failed to see how Mr. Ettinger's bridge in Fig. 1 worked. At first flash it looked like a full bridge, but two of the rectifiers were the wrong way round for that, so it must be a half-wave bridge.

Mr. P. J. Price said that a bandwidth of 25 kc/s on d.c. amplifiers was very low. A better bandwidth could be obtained by using an unstabilised d.c. amplifier and stabilising it with a chopper amplifier. The difficulty lay in stabilisation of the amplifier when feeding back.

Dr. C. J. Candy said with regard to noise that there was perhaps an advantage in the chopper amplifier. With 3 kc/s there was a lot of noise, but it was reduced by centring to 2 kc/s.

Underwater Cables in Plastic Pipes

IN the course of the construction of a 60 kV ring around the town of Kassel in Western Germany it was necessary to lay the cable across the Fulda River. Of the possible alternatives of using the existing railway bridge, an underwater steel conduit, the laying of the cables in a dredger-made ditch, or sluicing them into the bed of the river, the last method was selected following the offer from a Hamburg firm to provide plastic pipes for cable protection. The plastic pipes were laid first and the cables drawn through afterwards.

A relationship between the costs of the various methods of river crossing is indicated by the following purely comparison figures:—Steel conduit 100; dredged duct 84; sluicing-in, using submarine cable, 72; sluicing-in, using ordinary cable with plastic pipe protection, 75.

Particulars of the project were as follows:—Length of underwater part, 80 m; number of cables, five; nature of river bed, heavy clay with much gravel; maximum depth of water, 3 m; waterflow, 1 m/sec under normal conditions; and ultimate depth of cable in the river bed, at least 1·5 m.

The group of five cables consisted of two oil-filled three-core cables of 60 kV and three telephone and control cables, all 150 m long. The outside diameter of the 60 kV cable was 86 mm, and the weight 17·5 kg/m; the diameter of the telephone and control cables was 48 mm, and the weight 5·4 kg/m. The 60 kV cables were not provided with armouring or reinforcing spirals; they were laid dry, i.e. under nitrogen pressure and only filled with oil after laying. The plastic pipes were made of a polyethylene material.

CLASSIFICATION OF INDUCTION MOTORS BY TORQUE PERFORMANCE

By C. V. HILL, B.Eng., A.M.I.E.E.*

INDUCTION motor starting performance is defined by starting current and two salient points of the acceleration curve, starting torque and maximum torque. Because general purpose motors and users' performance specifications exhibit a somewhat wide range of values for these quantities it has been suggested that a classification of motors by starting performance along the lines of the American N.E.M.A. Standard should be made. This, it is claimed, would tell the users what to expect from the various types of motor, give greater uniformity and ultimately reduce the number of users' own specifications. There are, of course, practical difficulties to be overcome. Firstly, there is long-established British practice that gives both designer and user freedom of choice in these matters. Manufacturers cater for special market conditions, and users, apart from the special requirements of their own particular motor applications, look at the problem from a number of different standpoints. For example, they may have in mind the effect of motor starting current on auxiliary apparatus or on overload protection devices, they may wish to buy to some established standard or they may simply adopt a traditional outlook that seeks to minimise starting current as an end in itself. Any attempt at performance classification must reconcile the needs of the designer, manufacturer and user.

Starting Performance Nomenclature

During early induction motor development, supply undertakings, anxious to limit current demand in terms of the "pay load" as represented by the nameplate current, initiated the practice of using "per unit" terms for the starting performance quantities. Thus all torques are expressed as "times full load torque" and currents as "times full load current." For convenience this method will be followed here and the quantities stated in the order: starting torque—maximum torque—starting current. Thus a performance 2-4-8, means that in per-unit terms the starting torque is 2, the maximum torque 4 and the starting current 8. Originally, nearly all squirrel-cage motors had to be unloaded electrically and mechanically for starting by means of star-delta or auto-transformers and with fast and loose pulley drive or clutch, but improved supply facilities have enabled many of the earlier starting restrictions to be removed so that general purpose motors for direct starting duties can now be built. The custom of regarding starting current as a quantity to be restricted has persisted with many users. Thus, for a motor A with performance $1\frac{1}{4}$-2-5 and a motor B with figures $1\frac{3}{4}$-3-7, if the maximum torques 2 and 3 respectively were presented to a user he would probably choose motor B whereas if he saw only the starting currents 5 and 7 he would choose motor A. Such an attitude makes it difficult for a manufacturer to agree to stamp starting current on a motor nameplate where it would appear out of context and not related to other items of technical performance with which it should be associated.

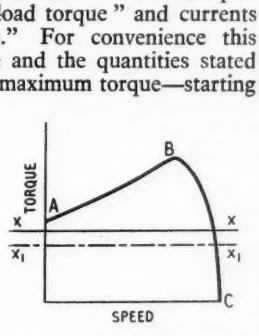


Fig. 1.—Accelerating torque/full load torque curves

* Industrial Machines Department, British Thomson-Houston Co., Ltd.

Technical Relationships

When considering the simple technical relationships between starting performance quantities it should be recognised that per-unit values imply comparison between two distinct aspects of motor performance, the maximum torque, related primarily to magnetic flux density, and the horsepower rating of the motor, which is mainly determined on a heating basis. The point is simply illustrated in Fig. 1 where ABC is a typical torque-speed curve depending on equivalent circuit constants. Obviously, without altering ABC some line XX or alternatively X_1X_1 can be chosen to represent "full-load torque." From the geometry of the elementary current locus or "circle diagram" it can be shown that approximately

$$\frac{Tm}{Is} = \frac{\text{Maximum torque}}{\text{Starting current}} = \frac{1}{2} \quad \ldots\ldots(1)$$

With starting current referred to input and maximum torque to output terms and allowing for approximations and tolerances

$$\frac{Tm}{Is} = 0{\cdot}5 \text{ to } 0{\cdot}55 \quad \ldots\ldots(2)$$

The high values occur for relatively low speeds and low power factors. For single-cage rotors of maximum torque 2 the starting current is $3\frac{1}{2}$ to 4. The important meaning of this relationship is that starting current and maximum torque are linked in a simple manner. Far from being wasteful, starting current is a direct measure of "size" of the motor as regards its function of producing torque, and, so regarded, a lower starting current denotes a smaller motor whatever its horsepower rating may be. For double-cage rotors where the current locus is not circular but depends upon the amount of "double-cage effect" employed approximate figures are

$$\frac{Tm}{Is} \text{ for double cage} = 0{\cdot}4 \text{ to } 0{\cdot}45 \quad \ldots\ldots(3)$$

There is no simple relationship between starting torque and starting current because a second variable, the secondary resistance, is brought in which is associated with electrical efficiency and heating considerations. Roughly in per unit terms

$$Ts = \textit{starting torque} = \textit{secondary resistance} \times (\textit{starting current})^2 \quad \ldots\ldots(4)$$

$$\frac{Ts}{Is} = \frac{\text{starting torque}}{\text{starting current}} = \textit{secondary resistance} \times (\textit{starting current}) \quad \ldots\ldots(5)$$

To "scale down" starting performance for a given motor the diameter of the circle diagram must be reduced by using a "deep bar" or "high reactance" rotor or by reducing the flux, the leakage reactance varying inversely as the flux. This process usually upsets the balance of

the original design, resulting in sub-optimum performance as regards efficiency and power factor and in larger dimensions and cost for a given output.

Practical Motors

Early designs aimed at a maximum torque of 2 and this was responsible for the momentary overload torque requirements of such standards as B.S. 168. A figure of 2 enabled overload and voltage variation requirements to be met and placed the working range of torque on the straight line portion of the stable leg of the torque-speed curve. That this figure is by no means unalterable is shown by recent changes in B.S. introducing momentary overload torque values of 1·6 and 1·75. No restriction is placed upon the upper limit of torque and in practice the figure of 2 is often exceeded.

When light starting was the rule for squirrel-cage motors the starting performance was chosen with a view to good efficiency and a typical curve is shown at A in Fig. 2. This curve is specified by the performance $\frac{3}{4}$ to $1\frac{1}{4}$—2 to $2\frac{1}{4}$—4 to 5 for starting torque, maximum torque and starting current respectively on full voltage with one-third of these figures on star-delta starting duty. With the growth of individual driving and full voltage starting on load the general purpose motor of, say, 1-50 h.p. and 4- or 6-pole speed needed a starting torque in the range $1\frac{1}{2}$-2 which could not be obtained by increasing the secondary resistance except by derating the machines to compensate for the additional heating. Improved magnetic materials, however, enabled the flux levels to be increased and the torque curve raised bodily to curve B, Fig. 2. Typical values for this curve are $1\frac{1}{2}$ to 2—3 to $3\frac{1}{2}$—6 to 7. Higher starting torque requirements were met with double-cage machines and thus three groups of typical starting performance figures emerged.

Group A—Low starting torque	1-$2\frac{1}{4}$-5 approx.
Group B—General purpose motors	2-$3\frac{1}{2}$-7 „
Group C—High starting torque	$2\frac{1}{4}$-2-5 „

The three groups are not sharply defined but overlap one another. A change from one group to another is liable to occur whenever there is some major change in motor construction such, for example, as a change from radial to axial ventilation, as may be required by considerations of economic design.

Design and Development

The progressive development of induction motors presents the designer with starting performance problems. The h.p. per r.p.m. per unit volume of active material termed the " output coefficient " is the product of two variables, the magnetic flux density or " magnetic loading " and the current sheet density on the rotor periphery or " electrical loading." The former is limited by the properties of the magnetic material and the latter by those of the insulating material and cooling system. The size of the motor depends upon the product of these factors and their ratio controls the shape of the machine and its maximum torque and starting current performance. Progressive design since, say, 1900 has raised the output coefficient so that for certain frames the h.p. output has

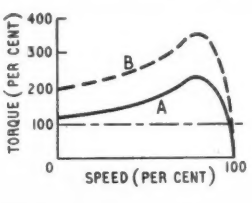


Fig. 2.—Motor torque/speed curves

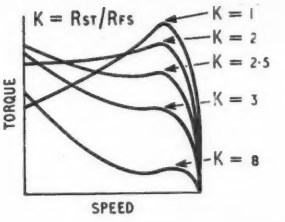


Fig. 3.—Torque/speed curves with varying K and constant R_{FS}

increased five-fold. Early motors had low flux levels and the problem was to ensure that the required maximum torque figure of 2 was attained. For a long time improvement has involved an increase in magnetic loading resulting in higher values of maximum torque and starting current. More recently, with the introduction of Class E insulation and higher temperature rise, the relative electrical loading has risen, tending to lower the maximum torque and starting current. The uprating of motors by increased electrical loading introduces starting performance problems for general purpose motors where the previous starting torque figures must be maintained. These may be solved by utilising certain properties of the double-cage rotor. The " double-cage " effect for such rotors is adjustable in the initial design and can be measured as in Fig. 3 by the quantity K, the ratio of starting resistance to running resistance. K=1 corresponds to a single-cage rotor but the usual " high-torque " rotor has a value of K between 2 and 2·5. For lower values between 1 and 2 no derating of the frame is usually required and these may be utilised to exchange some of the maximum torque performance of the single-cage characteristic for increased starting torque. This exchange cannot be made without loss because of the difference in starting current represented by expressions (3) and (4).

Fig. 4 shows the performance of a typical general purpose motor and curve A with values 2-4-8, uses torque scale A on the left of the diagram. If the electrical loading is increased to obtain 50 per cent more horsepower output the torque scale is now scale B on the right of the diagram and the full-load torque line is raised from XX to X_1X_1. In terms of the new horsepower the starting performance becomes 1·33-2·7-5·4, and the starting torque figure of 1·33 is now too low for good general purpose motor performance. If the flux could have been increased as the square root of the horsepower curve B would have resulted with a performance in terms of the new h.p. of 2-4-8. If the flux cannot be raised it may be possible to use a normal double-cage rotor and obtain curve C with a performance of 2-2·25-5·5 thus restoring the starting torque at the expense of the maximum torque. If this alternative would cause overheating a rotor of lower K might be used leading to curve D and performance $1\frac{3}{4}$-$2\frac{1}{2}$-6, or else a suitable combination of double-cage rotor with flux increase may be achieved.

Users' Requirements

It is in the range 1-50 h.p. of the general purpose motor that most starting problems occur because manufacturers must provide a comprehensive level of starting performance whereas actual applications have widely differing requirements.

Light-starting duties as for centrifugal pumps and fans are well covered by Group A motors with approximate performance of, say, 1-$2\frac{1}{4}$-5. A Group B motor with performance, say, 2-$3\frac{1}{2}$-7, will give satisfactory drive for the following reasons:—The rotor of an induction motor and in many cases the driven apparatus has considerable

inertia so that it is advantageous to have a good accelerating torque even though high starting torque is not required. The shape of the single-cage acceleration curve gives nearly constant accelerating torque up to the maximum torque point and is thus more suitable than a double-cage rotor that has a flatter torque curve.

Certain duties, such as ring-spinning frame drives, are held to require a controlled accelerating characteristic; such drives require a high reactance or double-cage motor and are larger and more expensive than the general purpose motor.

Individual drives and machine tool duties now account for a large proportion of the general purpose motors put into service. In many such drives the motor does not attain its assigned temperature limits because its size is determined by the maximum torque performance rather than by the nameplate h.p. A motor with a high maximum torque and starting current may have an advantage. For example, a 7½ h.p. motor with starting current 8 may prove cheaper than the 10 h.p. motor with starting current 6 that gives the same maximum torque. It is to be preferred from a purchaser's viewpoint that these duties should be assigned when possible to general purpose motors and the process illustrated in Fig. 4 would make this more difficult. A conventional relationship between maximum torque and nameplate h.p. can often be obtained by giving the motor an intermittent rating but this idea has not proved generally acceptable.

Auxiliary Effects

Behind many starting performance specifications lies the mistaken belief that various mechanical and electrical difficulties could be avoided by limiting starting torque or starting current. Except for considerations of overload protection these effects depend upon absolute rather than relative values of torque or current and even a reduction in the absolute values may be ineffective. Thus, if contactors are falling out due to the line drop in voltage caused by a 15 h.p. motor with starting current 8 then limiting the current to 6 simply raises the h.p. at which the effect occurs from 15 to 20. Other voltage drop effects such as a lamp flicker may not be noticeably improved by any practicable reduction in starting current. A common mistake is to suppose that an improvement in motor starting torque in cases of heavy line drop is to be obtained by imposing a starting current limit. This is not so because the direct effect in reducing starting torque due to increasing the leakage reactance so as to limit the starting current is greater than the indirect effect in the direction of higher torque due to raising the motor terminal voltage whilst starting.

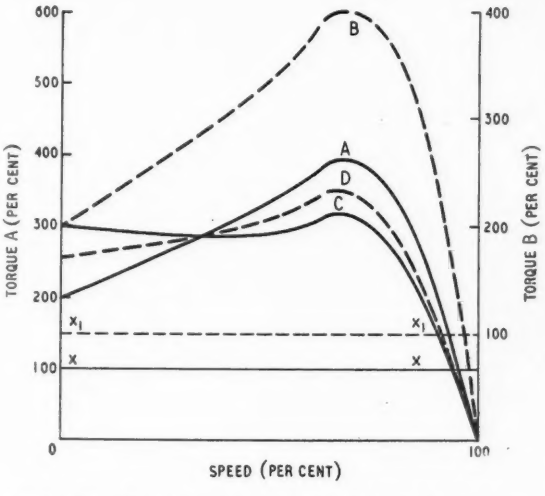


Fig. 4.—Torque/speed curves showing effect of exchanging maximum torque for starting torque by using double cage rotors

Improvement in these and similar cases may come from using a rotor with a higher starting torque per ampere such as the double-cage, high-resistance or slip-ring types, and by avoiding " overmotoring " the drive.

Mechanical difficulties are less frequently encountered than is commonly supposed because shafts and couplings have only to transmit the resisting torque of the load and the motor accelerating torque is distributed between the rotor and its load in the ratio of their respective inertias at motor shaft speed. With some kinds of transmission such as spur gearing there may be sufficient back-lash to allow the rotor to accelerate an appreciable way towards full speed before taking up the clearances. The kinetic energy thus acquired by the rotor may cause a harmful hammer blow on the transmission gear so that a high starting torque would be a disadvantage. This is one of the cases where it is usual to specify a slip-ring motor.

Starters and Overload Protection

A study of the operation of overload protection devices commonly used on British starters shows that to obtain satisfactory protection both at starting and when running on load the motor inrush current must be kept down to the value of 8 permitted by the starter standard B.S. 587. This value appears from the foregoing to be ample for a satisfactory general purpose motor and it might therefore prove of considerable assistance to users in the choice of a starter if motor makers would declare their willingness to keep starting current down to this value. When stock motors are derated, as, for example, a 10 h.p. motor with starting current 8 derated to 8 h.p. at the same voltage, the per-unit starting current increases, in this case from 8 to 10. By selecting a 10 h.p. starter, however, and setting the overload device for this rating the increase in starting current is avoided in terms of the starter rating and it is possible to obtain full starting time allowance from the device and also to protect the motor against overheating under service conditions.

N.E.M.A. Standard

The American N.E.M.A. Standard is a long-established classification of induction motors by torque performance from which a number of useful observations can be made. It is designed for use with the N.E.M.A. dimensional standard and the specified performance figures are tabulated against the recognised horsepowers from 2-pole to 16-pole speeds. They include starting and maximum torque and starting current for five electrical designs coded under reference letters A, B, C, D and F. Roughly, each design is associated with one of the familiar types of rotor construction. Thus A and B are general purpose motor designs, C is for high starting torque double-cage rotor machines and designs D and F are for high-resistance rotor and " high-reactance rotor " types respectively. In design A the starting current is not limited and this enables a low impedance rotor to be fitted when there is a call for high efficiency performance without sacrificing the dimensional standardisation. The performance standard has remained stable for a long time although the dimensional standard has several times been completely recast. By our ideas the figures represent a modest performance for each type. Their validity appears to be generally accepted so that it is not easy

to discover how they were originally determined. There seems to be a historical basis: thus the maximum torque of motors of 10 h.p. and upwards was taken as 2 with progressively higher figures for the smaller outputs where relatively higher magnetising current has its effect and frictional loads are higher. Some latitude was kept on the starting current derived from expression (2) and an approximate figure of 6 was chosen. This is specified in amperes per h.p. at 220 V. For all motors of 20 h.p. and above the figure is 14·5 A per h.p. at 60 c/s and 16·7 A per h.p. at 50 c/s with higher values for the smaller motors. It is to be noted that there is one value only for all enclosures and for each of the four designs B, C, D and F. To avoid exceeding these figures due to progressive uprating of frames and higher flux levels some makers carry two double-cage rotors, one for the general purpose design B and another for the high torque design C. The figures include their own tolerances. The current value of 14·5 A per h.p. corresponds to a per-unit value of 1·96 × efficiency × power factor. With apparent efficiencies (efficiency × power factor) of 81 per cent the starting current is 6. These figures are claimed to include a reasonable manufacturing tolerance that does not encourage salesmen to trade upon the tolerance by offering a higher maximum torque than the standard specifies. It should also be noted that the effect of the standard is to keep the maximum torque down to 2 whereas it is shown in the foregoing that for British machines the starting torque requirements of general purpose motors when taken with the requirements of economic design may encourage higher values than 2.

An important feature of the N.E.M.A. Standard is its presentation to the public as a complete performance scheme so that users need not set up their own specifications. In each tabulation it is stated that the figures represent the upper limit of the range of application for the design and in Tables A and B the user is asked to consult Tables C and D when higher torque figures are required. There is no suggestion that higher values of torque or lower current figures could be achieved and this situation appears to command general acceptance. This bringing together of the upper and lower limits of performance to the values given in the tables avoids creating selling difficulties. Market conditions are mainly concerned with the limiting performance values at which extra price becomes necessary, that is, with maximum torque and minimum starting current rather than with the other limits of minimum torque and maximum starting current usually covered in a technical specification. Any standard that specifies torque values as " not less than " or starting currents as " not more than " leaves the commercial requirements unspecified.

Returning to the problems of a British standard, it has already been suggested in the foregoing that a starting current of 8 has much to recommend it. The tolerances recently added to B.S. would convert a figure of 8 without tolerance into one of, say, 6·7 with a +20 per cent tolerance. It is at once evident from (2) and (3) that a starting current of 8 corresponds to a maximum torque of the order of $3\frac{1}{2}$ for a single-cage and 3 for a double-cage rotor. To avoid the above difficulties it may be expedient to consider only one of the interdependent variables, say starting current, and to leave torque unspecified except as already covered in B.S. in the form of a momentary excess torque requirement.

The future seems to hold two possible courses. The first is to leave the designer of electrical motors a freedom of choice in respect of performance based on his experience of past applications. The second is to move towards some form of standardisation where figures are tabulated as a target for standard motors. In the author's opinion the former is the preferable course.

World Power Conference in 1958

THE theme of the Canadian Sectional Meeting of the World Power Conference to be held in Montreal from 7th to 11th September next year will be " economic trends in the production, transportation and utilisation of fuel and energy." The papers committee (under the chairmanship of Sir Josiah Eccles, deputy chairman, Electricity Council) has arranged for sixteen papers to be presented by the British National Committee. The subjects and authors of each will be as follows:—

" Pumped Storage at Blaenau Ffestiniog," by E. S. Booth (C.E.A.) and G. Kennedy (Kennedy & Donkin); " Variable-Pitch Runners for Water-Turbine Pumps," by P. Deriaz and J. G. Warnock (English Electric Co.); " Integration of Coal-Fired, Nuclear and Hydraulic Generation," by J. Henderson (South of Scotland Electricity Board) and C. L. C. Allan (North of Scotland Hydro-Electric Board); " Financing Power Development," by C. L. Blackburn (Merz & McLellan); " Mechanisation of Coal Mining in Great Britain," by H. A. Longden (National Coal Board); " Changing Pattern of Demand for Oil Products," by M. E. Hubbard (British Petroleum Co.); " Fuel Resources and Gasification," by J. E. Davis and C. Ryder (S.E. Gas Board); " Economics of Nuclear Fuels," by J. A. Jukes (U.K.A.E.A.); " Economic Trends in Designs of British Thermal Power Stations," by J. T. Moore (Ewbank & Partners); " Future of Nuclear Reactor Systems," by Sir Christopher Hinton (chairman, Central Electricity Generating Board) and L. Rotherham (U.K.A.E.A.); " Design of Large British Nuclear Power Stations," by H. West (A.E.I.-John Thompson Nuclear Energy Co.); " Geothermal Power Generation," by T. G. N. Haldane, B. Wood and H. C. H. Armstead (Merz & McLellan); " Fuel Efficiency in U.K.," by W. A. Macfarlane (N.I.F.E.S.); " Oil and Productivity," by T. C. Bailey and R. J. Bressey (Shell-Mex & B.P.); " Industrial Use of Gas," by S. G. Aberdein and A. E. Tyrrell (North Thames Gas Board); " Capital Requirements for Use of Energy," by G. H. Daniel (Ministry of Power).

The general programme will be obtainable in January from the British National Committee, World Power Conference, 201, Grand Buildings, Trafalgar Square, London, W.C.2. It will contain information concerning technical visits and post-Conference tours. One of these tours will provide a link with the 6th International Congress on Large Dams opening in New York City on 15th September, 1958.

The recent election of Bulgaria and Colombia brings the number of member countries and territories to fifty-two. Major-General H. A. Young (Deputy Minister of Public Works and chairman of the Canadian National Committee, World Power Conference) has been elected a vice-chairman of the International Executive Council in succession to Dr. A. J. Alves de Souza (Brazil) whose term of office has expired.

VIEWS on the NEWS

By REFLECTOR

AT a luncheon following on the inauguration of a substation at Exeter last week the Mayor of the city contrasted the neat appearance of the new structure with an earlier substation at Southernhay in the city wall. He implied that the South Western Electricity Board had been responsible for this, but I was assured that the Southernhay building was the work of the former city Electricity Department and therefore the blame was, so to speak, on the Mayor's own head. I am afraid the Boards have to bear the blame for much of the shortcomings of their predecessors; it seems as though only the virtues of the former owners are rightly attributed.

* * *

Advocates of the motor-bus seeking to denigrate the trolley-bus make most play of the fact that it "hogs" the road and if it breaks down cannot be got out of the way of the traffic behind it. Actually, of course, these fears are greatly exaggerated; unlike trams, trolley-buses can draw near to the kerb to take up and discharge passengers and breakdowns are few and do not often cause trouble. There is more substance in a recent complaint in the *Evening Standard* that trolley-buses are too silent. While in clear weather this may be accounted a virtue, during a fog it may involve danger to people endeavouring to cross a road. It was suggested that trolley-buses should be equipped with bells similar to those in ambulances or fire engines. Of course the old trams always had bells and the drivers used to use them pretty freely in fog, and otherwise.

* * *

Electricity was commonly advertised as a panacea in the latter part of last century. A correspondent has sent me a typical "puff" (extracted from a cookery book dated 1888) in which one J. L. Pulvermacher, whose trade mark was "Electricity is Life," set out the virtues of his medico-galvanic system. It was claimed that Pulvermacher's "galvanic chain bands, belts, batteries, etc." cured indigestion, liver complaints, asthma, loss of voice, rheumatism, epilepsy—and nearly everything else. It was beautifully said that:—

> "These highly improved inventions render electricity, in a mild continuous form, perfectly self-applicable and extremely efficacious, no shock or unpleasant sensation being experienced, thus it becomes a true fountain of health and vigour, speedily soothing agonising pains, reanimating torpid limbs, reviving the sluggish functions of life, and imparts renewed energy and vitality to constitutions enfeebled by various influences."

* * *

Last week the B.B.C. put on a television play, "Seeds of Power," which was concerned with the activities of the staff of an Indian atomic power plant. Sabotage was only one of the troubles at this station; there was also a great deal of "human interest," including an affair between the wife of one of the physicists and another man. I was relieved to hear one of the characters say, in the middle of all these goings on:—"Calder Hall is nothing like this."

* * *

A strange happening is reported in the New York *Electrical World* under the heading "TV Takes its Toll":

> "Because of a fire in their TV set, Mr. and Mrs. Frank J. Mello are suing Sacramento Municipal Utility District for over $55,000. The couple contend the fire was caused by a short circuit in a SMUD transformer near their home and that SMUD was negligent in maintaining the transformer. The $55,000 would compensate Mrs. Mello for injuries to her back and nervous system in putting out the TV fire before it burned down the house. They also seek $441.86 for repairs to the TV set."

Unfortunately for any Electricity Boards who may be interested we shall probably never hear what happened in this peculiar law suit.

* * *

On a number of occasions I have referred to the fear of the Scots that electricity generated in their country is sent over the border and retailed at cheap rates to the Sassenach. Dealing with a complaint of a very substantial rise in the electricity bill of an Inverness factory, the chairman of the Highlands and Islands Advisory Committee, stated that the Committee had been told that the heating account of the factory had gone up from £108 to £175 a quarter under the new tariff. He went on to say:—"Yet it was claimed that a similar factory in Yorkshire was being heated for half the price and was possibly importing electricity from power stations in the Highlands."

* * *

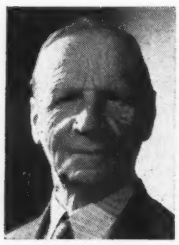
Eighty years ago odious comparisons were being made between English and American "telegraphists" and "electricians" (both terms were applied in those days to quite senior engineers and scientists). The *Electrical Review* of 15th December, 1877, took up the cudgels on behalf of the maligned English. It was agreed, in the face of other claims, that the telephone was the invention of Alexander Graham Bell, but he, of course, was a Scot turned American. But when the *Review* turned to "English" contributions to electrical science, most of those mentioned seem to have been Scottish. After referring to Dr. Kerr, the article drew attention to the work of Clerk Maxwell and Sir William Thomson (Lord Kelvin). The introduction of electric signalling on railways was claimed for English telegraph engineers, although it was said that most of this work was not generally appreciated in this country. In another direction, the *Review* said:—"The network of ocean cables has been rapidly spreading, and is still spreading, and the whole of this is due to English enterprise and skill."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. W. H. Apthorpe, managing director of the Cambridge Instrument Co., Ltd., will retire from executive duties at the end of the year. He will retain his seat on the board and continue to be available for special duties as deputy chairman.

Mr. Apthorpe started his training with the company in 1900, and for seven years gained experience under the late Sir Horace Darwin. He resigned in 1907 in order to obtain further experience in association with Mr. Clarke-Fisher and the late Mr. R. W. Paul, and three years later was appointed assistant to the late Prof. Donnon at Liverpool University. In 1914 Mr. Apthorpe returned to the Cambridge Co. to take charge of its Testing Department, and when Mr. Paul's business was absorbed by the company in 1919 he was appointed to



Mr. W. H. Apthorpe

Mr. H. C. Pritchard

the position of works manager at the London factory. In 1925 he was appointed a director, and had since held in succession the position of director of production, joint managing director, and managing director.

Mr. Apthorpe will be succeeded as managing director by **Mr. H. C. Pritchard,** who is at present with Elliott Bros. After taking high honours at Oxford he went to the Air Ministry on research and development work and in 1939 was appointed head of the Navy Section at the R.A.E. After the war he became head of the Blind Landing Experimental Establishment at Martlesham for a period and then returned to the R.A.E. as head of the Instrument and Photographic Department. In 1949 Mr. Pritchard was seconded to the Australian Government as chief superintendent of the Woomera Rocket Range, later returning to this country to join Elliott Bros. He will take up his duties as managing director on 1st January.

On 5th December **Mr. C. Barwell,** general publicity manager, Mullard, Ltd., completed twenty-five years' service with the company. He was presented with a cheque and an 8-day mantel clock by Mr. S. S. Eriks, managing director, who with other Mullard directors and executives entertained Mr. and Mrs. Barwell to lunch. Many other gifts were presented to Mr. Barwell by his colleagues from all parts of the organisation.

Dr. T. G. Pickavance has been appointed director of the new high energy laboratory at Harwell of the National Institute for Research in Nuclear Science. He is deputy head of the General Physics Division of the Atomic Energy Authority's research establishment at Harwell.

Mr. A. H. Adey and **Mr. W. Elliott,** B.Sc., M.I.E.E., retired on 31st October from the joint district office managerships of Birmingham and Cardiff, respectively, of Siemens Edison Swan, Ltd., leaving **Mr. J. R. Yeates** as the sole district office manager in Birmingham and **Mr. W. A. Cooper** in Cardiff.

Mr. Adey commenced his career in the Fittings Department of the General Electric Co., Ltd., before the 1914-18 war and after service with the Royal Warwickshire Regiment returned as showroom manager until 1922 when he left to join the Metropolitan-Vickers Electrical Co., Ltd. He became manager of Metro-Vick Supplies, Ltd., which changed in 1930 to the Edison Swan Electric Co., Ltd., whereupon he became manager of the Birmingham district office. Mr. Adey is an honorary life member of the Birmingham Electric Club and is vice-president of both the E.I.B.A. and the Electrical Trades' Commercial Travellers' Association.

After graduating in electrical engineering at London University, Mr. Elliott was apprenticed to the English Electric Co. in Stafford. He served in the Royal Engineers during the

Mr. A. H. Adey

Mr. W. Elliott

1914-18 war and afterwards returned to the English Electric Co. until 1921 when he was appointed district office manager of the Edison Swan Electric Co. in South Wales. Mr. Elliott has been an active member of the I.E.E. Western Centre and was chairman for the 1951-52 session.

On 31st July last Mr. Elliott and Mr. Adey became joint district office managers when on that date Siemens Bros. & Co. and the Edison Swan Electric Co., Ltd., integrated, forming Siemens Edison Swan, Ltd. Both have agreed to be available in a consultative capacity.

The Scottish Branch of the **Electrical Industries Benevolent Association** seemed likely to raise £4,500 this year as against £3,500 last year, Mr. J. S. Pickles told the 450 guests attending the annual dinner at the Grosvenor, Glasgow, on 3rd December. The Glasgow and West of Scotland Branch had last year contributed £780 and it seemed clear that this figure would be exceeded in the present year. Mr. F. Saunders was in the chair and he and his committee were congratulated on the arrangements for the function and the successful Scottish effort. Mr. Pickles also referred to the work done

At the E.I.B.A. dinner-dance held at the Grosvenor, Glasgow, on 3rd December. Left to right (front row): Mr. and Mrs. J. S. Pickles, Mr. and Mrs. F. Saunders, Mr. and Mrs. W. Allen Smith. Back row : Mr. and Mrs. Cartwright, Mr. and Mrs. Twaddle, Mr. and Mrs. J. Gogan

by Mr. William Allen Smith in Scotland. Mr. Cartwright thanked the organisers and the chairman.

At the annual general meeting of the British Association of Machine Tool Merchants (Incorporated), held in London on 26th November, **Mr. H. Widdowson** (Herbert Widdowson & Sons, Ltd.), Nottingham, was elected president for the ensuing year in succession to **Mr. A. W. Bell**, B.Sc. (H. Bell (Machine Tools), Ltd.), Leeds.

Lord Chandos, chairman of Associated Electrical Industries, Ltd., accompanied by the British Ambassador to Madrid, Sir Ivo Mallet, called on General Franco at his residence, El Pardo Palace, on 4th December.

Mr. K. F. Haylor, a member of the Society of Industrial Artists, has been appointed lighting fittings design consultant to Hailwood & Ackroyd, Ltd. In his new position Mr. Haylor will be responsible for the design of contemporary lighting fittings within the existing range. He was educated at Moseley and Birmingham College of Art, and joined the General Electric Co., Ltd., in 1937. After war service with the Royal Tank Regiment he returned to the company as special lighting fittings designer. In 1956 he founded Lighting Developments, a design consultancy for the manufacture of lighting fittings.

Mr. K. F. Haylor

British Insulated Callender's Cables, Ltd., opened a new depot at 511, Roumelia Lane, Boscombe, Hants. (telephone: Boscombe 36223), on 25th November. **Mr. A. J. Pearson,** who will be in charge of the new depot, joined the company in London in 1935, transferred to Southampton in 1938 and was subsequently appointed Bournemouth area representative. He received his technical education at the Borough Polytechnic, London, and at University College, Southampton. During the war he served with the R.A.O.C. and R.E.M.E. He is a member of the A.S.E.E. and is at present Southampton branch chairman.

Mr. A. J. Pearson

There were about 400 members and guests with their ladies at the annual ladies' night of the **Association of Supervising E'ectrical Engineers,** which was held on Saturday last at the Park Lane Hotel, London. Mr. G. H. Parker (national chairman) and Mrs. Parker received the guests, supported by Sir Harold Bishop (president) and Lady Bishop. Mr. E. A. Bromfield, secretary, although suffering from fractured ribs following a fall, bravely turned out for the occasion.

A.S.E.E. Ladies' Night. Left to right: Mrs. G. H. Parker, Mr. G. H. Parker (national chairman), Viscountess Kilmuir, Lady Bishop, Sir Harold Bishop (president), Mrs. E. A. Bromfield, Mr. E. A. Bromfield (general secretary)

The only toast of the evening (apart from the loyal toast) was to the ladies, and this Mr. Parker proposed in gallant and witty fashion during which he dared to draw attention to some of their foibles, but tactfully added that the men would not have the ladies otherwise. The response was made by the Viscountess Kilmuir, president of the Electrical Association for Women, who made a delightful speech in which she spoke of the work electrical men were doing for the emancipation of women. She also referred to the good work which the Electrical Association of Women was doing to make women more mechanically minded and said that it was helping to bring up a generation which would get things done by "the touch of the button—and by touching the right button."

Following dinner there was dancing during which an excellent cabaret was given by Alf Davies and Julie Reaby (*Star* ballroom champions), and Wallace, Delyse and Jeanette (international dancers).

The annual dinner and cabaret of the **Telegraph Construction & Maintenance Co., Ltd.,** was held at Claridge's on 4th December. Sir John Dean, chairman of the company, presided, and Sir John Maud, Permanent Secretary to the Ministry of Power, proposed the toast to the company, to which Sir John Dean replied. Mr. H. F. Wilson, assistant managing director, cables group, proposed the health of the visitors and Mr. Kenneth Horne replied.

Mr. B. B. Ray, M.B.E., M.Sc.(Eng.) London, M.I.E.E., has been placed by the Government of Orissa at the disposal of the Nangal Fertilizers Co., with whom he will be responsible for the execution of the electrical work for the fertiliser factory and the heavy water plant consuming approximately 160,000 kW which will be available from the Bhakra Dam project. Mr. Ray's address is: Deputy Chief Engineer, Nangal Fertilizers & Chemicals, Nangal.

Mr. C. V. Hill, B.Eng., A.M.I.E.E., who writes in this issue on "Classification of Induction Motors by Torque Performance," graduated at Liverpool University in 1916 and joined the Test Department of the British Thomson-Houston Co., Ltd., Rugby. After a brief period in this department and subsequent service with the R.N.V.R. he was employed in the A.C. Engineering Design Office. In 1921 he transferred to the Supply Department, and for many years has held a responsible position in this department and in the subsequently formed Industrial Sales and Industrial Machines Departments, and has been concerned with the technical side of a.c. machines and their industrial applications. He serves in this capacity on a number of B.E.A.M.A. Committees.

Mr. C. V. Hill

Mr. L. G. Applebee is retiring to-day (Friday) from the Strand Electric & Engineering Co., of which he has been a director since 1945, after thirty-five years' service. Mr. Applebee has a lifelong connection with the stage, beginning in the days when his father was master gasman (later electrician) to George Edwardes at the Gaiety. During his service with the Strand Electric &

Mr. L. G. Applebee

Engineering Co. he has been responsible for the stage lighting installations in the majority of theatres and many of the cinemas all over the British Isles, including the Shakespeare Memorial Theatre, Stratford, the Covent Garden Opera House, Drury Lane and the Old Vic. He has played a large part in stimulating the export of British stage lighting all over the world and has travelled extensively. Mr. Applebee is a Fellow of the Illuminating Engineering Society, and is well known as an authority and a lecturer on his subject, both in Europe and in the United States. Internationally, he has been a prominent figure as chairman of the Stage Lighting Committee of the Commission International d'Eclairage since 1938.

A. H. Hunt (Capacitors), Ltd., announces that on account of the growth of its activities, both in the electronic and electrical capacitor fields, a reorganisation of sales has been arranged so that both sides can be adequately serviced.

Mr. E. A. Benwell, who has been with the company twenty-four years, will no longer be connected with sales to the electronic industries but will take over complete charge of the sales to the electrical industries and the power factor improvement section.

Mr. E. A. Benwell

Mr. J. Moor

His two immediate executives will be **Mr. N. H. Bentley** on sales to the electrical industry and **Mr. G. R. Arthur** on power factor improvement installations. The sales offices of this new section will be at the new factory at Vulcan Way, King Henry's Drive, New Addington, Surrey (telephone: Lodge Hill 2661).

The Electronic Division will operate from the head office at Wandsworth as hitherto, with **Mr. J. Moor,** who has been with the company twenty-five years, as sales manager, **Mr. G. F. Clemson** as his chief executive and **Mr. C. D. Grout** as the chief electronic representative. Government contracts will be handled by **Mr. S. H. Hunter** as sales executive. From 1st January all correspondence regarding the electrical industry and power factor side of the business should be addressed to the New Addington factory.

A London "smog" at its worst was no doubt responsible for many of the unoccupied seats at the concert given by the **Lessa Music Society** (London Electricity Sports and Social Association) last week at St. Pancras Town Hall, but those who did brave the hazards of the night were well rewarded by a performance in which orchestral and choral works were nicely balanced. The fog delayed the arrival of Mr. Douglas Sharpe, the choirmaster, and Mr. Leslie Atkins therefore conducted the whole of the first half of the programme. The main orchestral item was Borodin's second symphony and after a somewhat uncertain start, Mr. Atkins secured a very satisfactory performance. The popular "March Slav," by Tchaikovsky, opened the concert and this was followed by three part songs. After the interval there were carols (now conducted by Douglas Sharpe), the choir being particularly good in Sir Malcolm Sargent's arrangement of the "Cowboy Carol." The audience having been given the opportunity to display its vocal powers in two popular carols, the programme concluded with a satisfying abridged concert version for chorus and orchestra of Bizet's "Carmen."

The Gresham-Lion group of companies announces the appointment of **Mr. R. M. Nicholson** as northern area manager, in which position he will be responsible for the activities of the group in N.W. and N.E. England, N. Wales and N. Ireland.

Mr. Nicholson received his technical training with Lever Bros. (Port Sunlight), Ltd., and Birkenhead Technical College. In 1939 he joined D.E.E., Admiralty, and on the outbreak of war was seconded to W.E.S., London and S.E. Area, later being transferred to the N.E. Area. In 1948 he joined Cable & Wireless, Ltd., and was closely associated with the ship reconstruction programme, culminating with the company's latest cableship, C.S. *Recorder.* Mr. Nicholson joined the sales division of Gresham Transformers, Ltd., in December, 1956.

The group has appointed **Mr. P. E. Simmonds,** A.M.I.E.E., as Midlands area manager and he will be responsible for an area bounded by the counties of Staffordshire, Lincolnshire, Northamptonshire and Herefordshire.

Mr. Simmonds received his technical training with the Leicestershire & Warwickshire Electric Power Co. and Leicester Technical College. He spent many years in the electricity supply

Mr. R. M. Nicholson

Mr. P. E. Simmonds

industry, holding appointments with Blackpool Corporation Electricity Department, the Yorkshire Electricity Power Co. and the East Midlands Electricity Board. In 1950 Gresham Transformers appointed Mr. Simmonds distribution transformer sales engineer, responsible for negotiating C.E.A. and Electricity Board business.

Mr. J. F. Perry, A.M.I.E.E., has retired from the board of the Metropolitan-Vickers Electrical Export Co., Ltd., of which he was managing director, and also from the board of the parent company, the Metropolitan-Vickers Electrical Co., Ltd.

Mr. Perry joined Metropolitan-Vickers (then British Westinghouse) in 1913. After the 1914-18 war he served as a member of the French Reconstruction Committee in replanning the devastated collieries in the north of France. Later he travelled extensively in Australia, Africa and Europe in connection with the company's mining interests. In 1935 he was made sales manager of the M-V Plant Department. He was appointed general manager of the Export Company, of which he was already a director, in 1945, and became managing director at the end of 1948. Early in 1954 he was appointed a director of the Metropolitan-Vickers Electrical Co. In 1948 Mr. Perry was decorated by the Portuguese Government in recognition of his engineering services in connection with hydro-electric schemes in that country.

Consequent on Mr. Perry's retirement, **Mr. F. R. Mason** has been appointed managing director of the Metropolitan-Vickers Electrical Export Co., Ltd., and **Mr. H. F. Bibby** has succeeded Mr. Mason as the Export Company's general manager. Mr. Mason has also been appointed to the

At the annual ball of the Tyne and Wear Area of the Electrical Industries Benevolent Association. Left to right: Mr. R. H. Davison (area chairman), Mrs. Davison, Mrs. Crawford (presenting a bouquet to Mrs. Davison), and Mr. A. J. Crawford (chairman elect)

boards of the Metropolitan-Vickers Electrical Co., Ltd., and Associated Electrical Industries Overseas, Ltd.

After completing a college apprenticeship course with Metropolitan-Vickers Mr. Mason spent several years on power engineering work, including a year with A.E.I. (India), Ltd., as technical representative. In 1938 he became engineer-in-charge of the paper mill section of the General Engineering Department and he held this position until 1948, except for two years when he was seconded to the Ministry of Aircraft Production for work in connection with airborne

Mr. J. F. Perry

Mr. F. R. Mason

Mr. H. F. Bibby

electrical equipment. He was then appointed principal representative of the M-V Export Co. at the Trafford Park works and in 1951 he was appointed to the board, becoming general manager in 1954.

Mr. Bibby joined Metropolitan-Vickers in 1929 for the first year of a probationary college apprenticeship course, returning to complete the course four years later and then joining the staff of the Motor Engineering Department. In 1939 he transferred to the M-V Export Co., and went to The Hague as liaison engineer with the company's former agents in Holland, from which country he escaped to England with his wife three days after the German invasion. During the war he was engaged on development work in the Motor Engineering Department. Rejoining the Export Company after the war he returned to Holland as manager of its new office at The Hague. He was subsequently appointed manager, American Division, of the Export Company in London, and became assistant general manager in August, 1956, being appointed to the board on 1st January last.

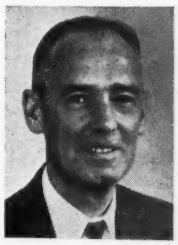
At the annual meeting of the Publicity Club of Cardiff **Mr. J. Vaughan Harries,** M.I.E.E., was elected senior vice-president.

On 5th December the **Johnson & Phillips Staff Association's** annual dinner-dance and cabaret was held at the Connaught Rooms, London, W.C.2. Mr. W. Glass, chairman and managing director of J. & P., proposing the toast of the Association, referred to the recent retirement of Mr. G. Leslie Wates and said he was sure all present would join in wishing him a speedy recovery from his illness. Speaking of the many meetings between the Association and the management, Mr. Glass said no punches were pulled, but the give and take spirit was always maintained and he hoped this would long continue.

In his reply, Mr. F. J. Aldridge, chairman of the Staff Association, congratulated Mr. Glass on his appointment as chairman of the company. He particularly regretted that it was not possible for Mr. Wates to be present to receive a volume signed by 1,300 members of the staff, both home and overseas, commemorating his twenty-five years' service as chairman of the company. He therefore asked Mr. Ainsworth Wates to accept this on his father's behalf. Mr. Wates said it was something his father would greatly treasure.

Telegrams of good wishes were read from Mr. G. Leslie Wates and from J. & P. branches at Melbourne, Sydney, Karachi, Germiston (South Africa) and Bombay.

Having reached the normal retiring age, after forty-four years' service, **Mr. H. A. Cooper,** F.C.I.S., director and joint general manager of the Micanite & Insulators Co., Ltd., is relinquishing executive responsibilities at the end of the year. He will, however, continue with the company in an advisory capacity and remain on the board for

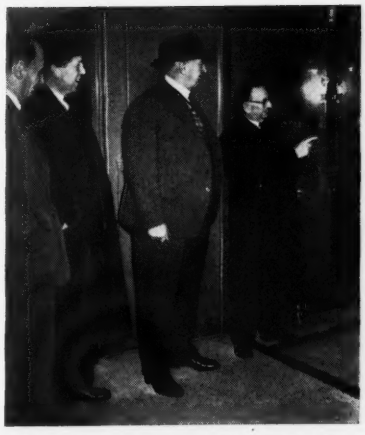


Mr. H. A. Cooper

Mr. R. F. Archer

a further period. **Mr. R. F. Archer,** B.Sc., A.M.I.E.E., who has latterly worked with Mr. Cooper as director and joint general manager, has been appointed managing director as from January next.

The **Electrical Industries Club** held its Christmas luncheon last Tuesday at the Connaught Rooms, London. Mr. A. F. Plummer (president) was in the chair and the guest speaker was Mr. Raymond Glendenning, the B.B.C. commentator, who gave the Club a good insight into his art. A vote of thanks was accorded on the proposition of Mr. R. Y. Sanders. The president announced that at the next luncheon, on 14th January, the speaker would be Mr. Colin Cowdrey, the well-known cricketer.



At the inauguration of the new "packaged" substation last week. Mr. A. J. Nicholas (South Wales Switchgear, Ltd.), on the right, explains the gear to the Mayor of Exeter (Lt.-Col. R. H. Creasey) while the Sheriff of Exeter and Mr. A. N. Irens, chairman of the South Western Electricity Board, look on

The Minister of Power has reappointed **Mr. H. E. Rhodes,** J.P., of Preston, as a part-time member of the North Western Electricity Board.

Mr. J. P. Halpin has been appointed a director of Renold Chains, Ltd.

OBITUARY

Mr. E. Rawdon Smith.—The death occurred, suddenly, on 7th December of Mr. Edward Rawdon Smith, O.B.E., M.A.; he was sixty-seven. Mr. Rawdon Smith read law at Oxford and was called to the bar of the Inner Temple in 1912. He served in the Army during the 1914-18 war and after being invalided out held Civil Service posts and was later secretary to George Spencer Moulton & Co. In 1926 he joined the London Underground group and upon the formation of the London Passenger Transport Board in 1933 he became assistant secretary and then from 1935 to 1939, was public relations officer. He left the L.P.T.B. in 1939 to become public relations director with the B.O.A.C. and he subsequently held similar positions with the Dominions Office and Ministry of Information. From 1944 to 1948 he was public relations counsel to the Edmundson group and other electricity supply companies and on the nationalisation of the supply industry he joined the English Electric group as public relations consultant, a position from which he retired in 1955.

Mr. Andrew Bailes, who represented Belling & Co., Ltd., in Yorkshire and had been with the company for twenty-three years, was killed in a motoring accident on 2nd December. He was sixty-two.

Central Electricity Generating Board

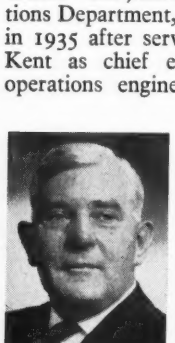
Regional Directors and Chief Project Engineers Appointed

IN our last issue we reported the appointment of five regional directors of the Central Electricity Generating Board. They are:—*North Eastern and Yorkshire*: Mr. P. Briggs, A.M.I.Mech.E., M.Inst.F. *Midlands and East Midlands*: Mr. R. L. Batley, O.B.E., A.M.I.Mech.E. *Eastern, London and South Eastern*: Mr. A. R. Cooper, M.Eng., M.I.E.E., M.Inst.F. *Southern, South Western and South Wales*: Mr. A. C. Thirtle, A.M.I.C.E., A.M.I.E.E., M.Inst.F. *North West, Merseyside and North Wales*: Mr. W. C. Parker, M.I.E.E., M.Inst.F.

Mr. Briggs is at present controller of the Yorkshire Division of the Central Electricity Authority. Before his appointment in March of this year, he was deputy controller of the North West, Merseyside and North Wales Division. When the electricity supply industry was reorganised in 1948, he was made responsible for the control and operation of all the power stations in the South Eastern Division, and later became controller of the Merseyside and North Wales Division before it was merged with the North Western Division in 1954.

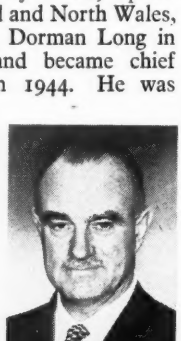
Mr. Batley has been controller of the Midlands Division of the C.E.A. for the past five years and was previously chief generation engineer (operation) of the Merseyside and North Wales Division. Before nationalisation he held power station appointments at Bradford, Hackney, Neasden and Swansea and at vesting date was superintendent engineer of generation in the Liverpool Corporation Electric Supply Department.

Mr. Cooper, who is a full-time member of the Central Electricity Generating Board, was formerly controller of the North West, Merseyside and North Wales Division, C.E.A. He joined the Central Electricity Board, Operations Department, North West England and North Wales, in 1935 after service with Pearson & Dorman Long in Kent as chief electrical engineer, and became chief operations engineer of the Board in 1944. He was appointed controller of the Merseyside and North Wales Division in 1948 and of the North Western Division in 1951.



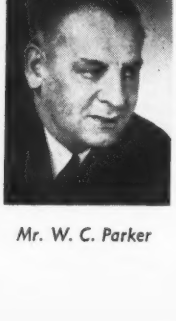
Mr. P. Briggs

Mr. R. L. Batley



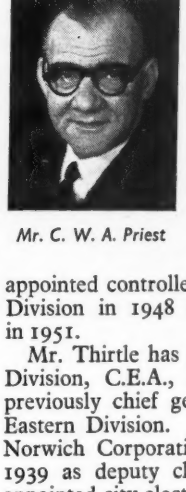
Mr. A. R. Cooper

Mr. A. C. Thirtle

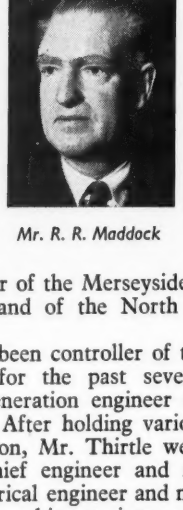


Mr. W. C. Parker

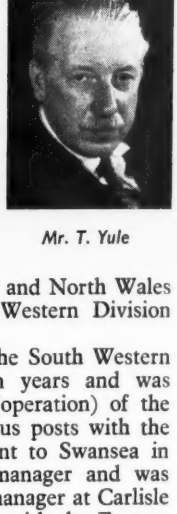
Mr. H. J. Bennett



Mr. C. W. A. Priest



Mr. R. R. Maddock



Mr. T. Yule

Mr. Thirtle has been controller of the South Western Division, C.E.A., for the past seven years and was previously chief generation engineer (operation) of the Eastern Division. After holding various posts with the Norwich Corporation, Mr. Thirtle went to Swansea in 1939 as deputy chief engineer and manager and was appointed city electrical engineer and manager at Carlisle in 1944. He took up his appointment with the Eastern Division on vesting day.

Mr. Parker has been controller of the South Eastern Division since 1948. Before nationalisation he was for fifteen years with the Fulham Electricity Department, and for the last thirteen years was borough electrical engineer. During the latter part of this period, he acted as electrical and mechanical engineering consultant to the Council in the extension and construction of the Fulham power station, and was awarded the Telford Premium of the Institution of Civil Engineers for 1937-38. Earlier in his career Mr. Parker had wide experience both at home and abroad on the engineering and commercial side of electrical manufacturing, including service with the English Electric Co., Ltd., and Crompton Parkinson, Ltd.

In addition to the above appointments, Mr. H. J. Bennett, A.M.I.E.E., has been appointed controller of the London Division and deputy director of the Eastern, London and South Eastern Region.

Mr. Bennett has been controller of the South Wales Division since 1951, and was previously chief generation engineer (operation) of the London Division. He held appointments successively with the Portsmouth Corporation, the Powell-Duffryn Co. and, as charge engineer at the Padiham power station of the Lancashire Electric Power Co. In 1929 he joined the London Power Co., holding appointments first at Deptford and later at Battersea power station, where, in 1944, he became chief assistant engineer and later moved to the headquarters of the company as chief assistant engineer (generation).

The Board has also appointed three chief project engineers who will take charge of the three Engineering Project Offices which the Board has decided to establish to undertake construction work of power stations, including nuclear, and associated substations. They are:—*North* (North West, Merseyside and North Wales, North Eastern and Yorkshire areas), Mr. C. W. A. Priest, B.Sc.Eng., A.M.I.Mech.E., M.I.E.E.; *Midlands* (Midlands, East Midlands and South Wales areas), Mr. R. R.

Maddock, B.Eng., A.M.I.Mech.E., A.M.I.E.E.; *London* (London, Eastern, South Eastern, Southern and South Western areas), Mr. T. Yule, M.Eng., M.I.C.E., M.I.Mech.E., A.M.I.E.E., M.Inst.F.

Mr. Priest has been chief generation engineer (construction), South Wales Division of the Central Electricity Authority, since August, 1953, and was previously generation engineer (construction) of the Southern Division. After service in the 1914-18 war, he took a three-year full-time course in electrical engineering at Portsmouth College and received his training at the Dick Kerr Works of the English Electric Co., Ltd. In 1923, he joined the London Electric Supply Corporation as an assistant engineer at the Deptford power station, where, subsequently, after the station was taken over by the London Power Co., he became turbine-house engineer. He was turbine and electrical operating superintendent at Fulham power station for three years, when, in 1939, he joined the Battersea Borough Council as chief assistant engineer, later becoming deputy general manager and engineer.

Mr. Maddock has held the post of chief generation engineer (construction), Midlands Division, since December, 1951, and for four years previously was generation engineer (construction), Eastern Division. He served his apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., and was later engaged with the company on projects and contracts for complete power station layouts, and workshops for large railway electrification schemes. In 1938, he became assistant power station engineer of the Northmet Power Co. with whom he became power station engineer (construction) in 1946. Major works for which he was responsible included extensions to the Brimsdown "B" power station, reconstruction of the Willesden power station, and design and layout of the power station at Rye House.

Mr. Yule has been chief generation engineer (construction) of the Eastern Division since 1948. He took a degree in engineering at Liverpool University and served a college apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., with whom he subsequently continued service on erection contracts at home and abroad. From 1933 to 1938 he was employed in the Power Department of Imperial Chemical Industries and later held various appointments with the Sheffield Corporation Electricity Department. After a short period in 1943 with the West Midlands Joint Electricity Authority as assistant resident engineer, Ironbridge power station, he joined the Brighton Corporation Electricity Department in January, 1944, as power station superintendent and became deputy engineer and manager in the following year.

Mr. H. B. Morton, assistant legal adviser of the Central Electricity Authority, has been appointed deputy solicitor of the Generating Board. Mr. Morton was educated at Rossall School and was admitted a solicitor in 1928. He joined the legal staff of the Central Electricity Board in 1929 and was appointed deputy solicitor of the Board in 1944. Upon the reorganisation of the electricity supply industry in 1948, he took up his present post with the Authority.

Factory Electrification

A Half-Century of Development

A COMPREHENSIVE account of the development of the use of electrical power in a factory of the Singer Manufacturing Co., Ltd., during the past half century was given by Mr. J. R. McCulloch in a paper read before the Institution of Engineers and Shipbuilders in Scotland on 3rd December. About 56 years ago when additions to the plant became essential electric motor drives were introduced on a large scale, the necessary power being supplied from a works power house on the direct-current system at 240 V. By 1908 the factory had been completely changed over from the original direct-steam-driven to the electric group drive by motors suspended from the ceilings, the speed of the line shafts being increased from 180 to 200 r.p.m. Electricity also took the place of gas for artificial lighting.

Keeping Pace with Extensions

To keep pace with factory extensions, in 1913 an a.c. distribution system was installed, power being obtained from a 3,000 V, 40 c/s machine, the output of which was converted in three 1,250 kW rotary convertors, the motors at that time being still of the d.c. type. During the 1914-18 war machine tools for shell making were erected and were driven by 40 c/s motors, which were supplied through 3,000/400 V transformers. The substitution of 40 c/s motors running at 800 and 1,200 r.p.m. to drive shafting at 200 or 500 r.p.m. was accomplished by the use of laminated gears.

This system was in use until 1945 when it was decided to install 50 c/s plant and thus to remove the difficulties due to the use of non-standard frequency. Turbo-alternators with a maximum continuous rating of 8,000 kW and generating at 11 kV were employed to supply four sub-stations, each containing three 1,500 kVA transformers, of which only two, however, could be run in parallel. The purpose of this limitation was to restrict the current which could feed into a fault on the medium-voltage system and was effected by fitting Castell locks to the closing handles of each transformer and bus-section switch. There was one key fewer than the number of switches so that if three transformers were on load, one bus-section switch must be open.

Flexible Distribution

The introduction of machine tools driven by individual motors necessitated the use of a more flexible system of distribution. Overhead busbars of sections of varying capacity in which a fused plug was inserted every 2ft were therefore employed, the machine being connected by plugging a flexible cable into the nearest available socket.

Squirrel-cage star-delta connected motors were normal with slip-ring motors for the heavier starts. Where possible they were totally enclosed to prevent the ingress of fine cast-iron dust.

Power factor correction was effected by installing capacitors on all motors of 2 h.p. and upwards. Frequency changers were in use to supply woodworking tools at 120 or 300 c/s where the standard frequency might be too low to achieve a high-grade surface finish. Radio frequencies for special requirements, such as the pre-heating of tablets for plastic moulding, were provided by electronic circuits, while mains-frequency induction heating for melting aluminium and cast-iron swarf was a probable development.

INDUSTRIAL NEWS

E.T.U. Members' Protests

In last Monday's television programme, "Panorama," Mr. Woodrow Wyatt introduced the subject of the way in which elections for members of the Executive Council of the Electrical Trades' Union are conducted. He explained that the immediate cause of disquiet among the Union's members was the invalidation of votes cast for a non-Communist candidate, Mr. Cannon, who unsuccessfully challenged a Communist, Mr. Fraser. Mr. Wyatt interviewed several members of the London Station Engineers No. 14 Branch and the Mitcham Branch who objected to the methods adopted by the Executive Council which, they alleged, tended to favour the election of Communist candidates. Some of them said that the Union's rules were so complicated as to be incomprehensible to a large number of members and the Council was accused of altering rules when it found that they interfered with its purposes.

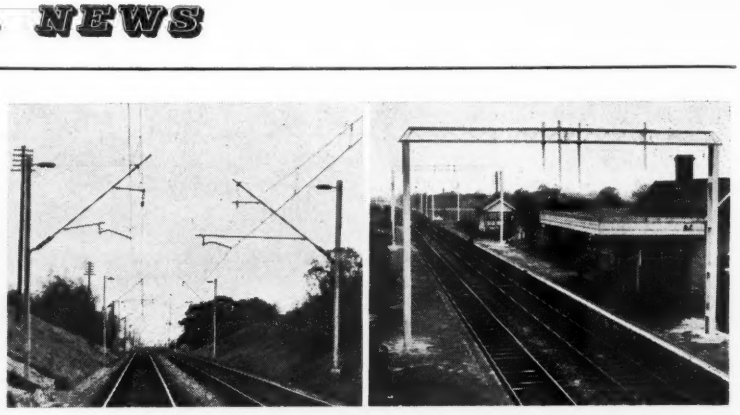
Mr. Wyatt said that he had asked the general secretary of the E.T.U., Mr. F. L. Haxell, and other members of the Council to express their views but he had been referred to a statement issued by the Council last week. This was to the effect that the Council was acting in accordance with the rules in disqualifying members who were not fully paid up; that this had been done for many years; and that the matter was solely the concern of the members and not of outside bodies.

London Train Disaster

Inquiry into the serious accident involving two trains at Lewisham, on the Eastern Section of the Southern Region, British Railways, on 3rd December, is proceeding. About 90 people were killed and many more seriously injured. Replying to suggestions that a fog service should have been in operation the Regional authority said that this was not the practice where colour light signalling was installed. "The colour light signalling system, with its powerful multiple aspect lights, not only clearly tells the driver the indication of the signal which is his immediate concern, but also tells him what indication he may expect to find at the next signal ahead."

Colchester-Clacton-Walton Electrification

The British Transport Commission reports that good progress is being made with the civil and electrical engineering work in preparation for the electrification of the Colchester-Clacton-Walton lines. This scheme is scheduled for completion next year and is being carried out on the 25 kV a.c. system for the immediate purpose of testing the new equipment and multiple-unit electric trains in the local services. At a later stage there will be a link-up with the extension of electrification from Chelmsford to Ipswich.



View of line looking towards Alresford station, showing partially adjusted simple catenary balance-weight tensioning equipment. Right: Overhead structures at Alresford station

Installation work on the overhead line equipment was commenced in March and at the end of October the erection of the overhead conductors was begun in the section between Wivenhoe and Alresford. Simple catenary construction is employed using 19/0·083in stranded cadmium copper catenary and a 0·166in single cadmium copper contact wire. The major part of the system will be of the automatic tension type with balance weights, fixed tension equipment being installed at terminal stations.

A 25 kV single-phase supply will be provided by the Central Electricity Authority to Colchester feeder station. As this is a pilot electrification project, a temporary supervisory control station will be provided adjacent to the feeder station.

Domestic Equipment Trades Fair

The Domestic Equipment Trades Fair will now take place at the National Hall, Olympia, London, from 2nd to 11th September inclusive.

"Queen of Light" Competition

The Mazda "Queen of Light" Competition, sponsored by the A.E.I. Lamp & Lighting Co., Ltd., reached its climax at the Lyceum Ballroom, London, on Monday last when this year's "Queen" was elected and crowned. She is Mrs. Norma Danby, of Nottingham, and she was chosen from nearly fifty "Queens of Light" representing towns and districts in the United Kingdom. Of the remaining eighteen finalists, the following were chosen as runners-up:—Miss Dianne Coltman of Southport (second) and Miss Joyce Cooke of Blackpool (third). The winner received a cheque for £100, presented by Mr. W. A. Renaut, secretary and controller, A.E.I. Lamp & Lighting Co., Ltd. The winning regional team was that from the southern region.

Power Convention Proceedings

We have received a bound copy of the proceedings of the ninth British Electrical Power Convention held at Eastbourne last June. In its 800-odd pages it includes Sir Josiah Eccles' presidential address (with a portrait), the fifteen papers and discussions and reports of other events. Copies of the proceedings are available from the Convention secretary, Mr. J. W. Simpson, Eastcastle Street, London, W.1.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £182 2s 6d
Fire Refined 99·70%	ton £181 0s 0d
Fire Refined 99·50%	ton £180 0s 0d
COPPER Tubes ..	lb 1s 9½d
Sheet	ton £210 15s 0d
H.C. wire and strip ..	ton £234 15s 0d
LEAD, English ..	ton £72 2s 6d
Foreign	ton £71 0s 0d
MERCURY	flask £69 0s 0d
TIN, block (English) ..	ton £730 15s 0d
ZINC, G.O.B. Foreign	ton £62 12s 6d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 6d
Sheet	ton —
Wire	lb 2s 3½d
PHOSPHOR BRONZE Wire	lb 3s 6½d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 25½d—25½d

Crystalline Boron

Technical Data Sheet No. 5-B, giving the physical characteristics, chemical properties and analysis of crystalline boron has just been

published by Borax Consolidated, Ltd. The company announced in July this year that they were marketing crystalline elemental boron in the pure state, and the two types dealt with in the data sheet show that the purity is as high as 99·15 and 99·6 per cent.

The low oxygen and nitrogen content makes the product particularly suitable for incorporation into alloys, and it is expected to be of interest to the electronic and metallurgical industries, and also for certain nuclear applications.

Copies of the data sheet can be obtained from the company at Borax House, Carlisle Place, London, S.W.1.

Improved Poultry Appliances

The twelfth National Poultry Show held at Olympia last week was the largest display yet staged and the attendances both at the three-day show and the convention arranged in conjunction with it were indicative of the expansion of the industry. On the trade stands attention was directed particularly to labour-saving devices, mostly electrically operated; in several instances manufacturers applied the term "automation" with some justification to appliances in which feeding, cleaning and other operations were carried out automatically. This aspect was to the fore at the convention, the subject of three of the sessions being "Increasing Efficiency on the Poultry Farm," "The Design and Operation of Poultry Feeding and Watering Equipment" and "Impact of Science on Traditional Methods."

Silver medals and diplomas were awarded by the organising journals, *Poultry World* and *Farmer & Stock-Breeder*, for appliances showing outstanding merit. Winners of the awards in this class were Cope & Cope, Ltd. (Cope's "Quik Stun" unit); Curfew Appliances, Ltd. (automatic drinking trough); Hanovia Lamps ("Radisil" infra-red heater); and John Shepherd & Sons, Ltd. (automatic "Feed-Ezie" battery). Judging was carried out by Mr. Willard Moore, Miss B. Lang and Mr. William Evans under the chairmanship of Sir Richard Haddon, C.B.E.

F. Westerman Join Edmundsons Group

F. Westerman (Wholesale), Ltd., Birmingham, has joined the Edmundsons group of companies. Mr. F. Westerman continues as chairman of the company and no changes will take place in staff or method of operation. Mr. H. E. Bagnall will continue as director in charge of administration. In addition to Mr. Westerman and Mr. Bagnall other members of the board are Messrs. A. H. Young, E. H. Maltby, N. G. Smith and D. L. Donne.

South Wales Institute of Engineers

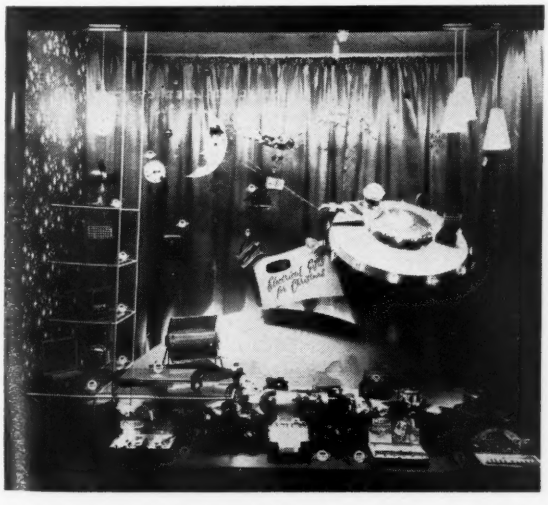
The annual dinner of the South Wales Institute of Engineers will be held on 16th January (6.30 for 7 p.m.) at the Park Hotel, Cardiff. Applications for tickets (£1 1s each) should be made by 9th January to the secretary of the Institute, Park Place, Cardiff.

Housecraft Advisers' Conference

Between 400 and 500 women representatives from Electricity Boards throughout the country will attend the annual four-day Conference of Electrical Demonstrators and Housecraft Advisers, which begins in London on 21st January. The conference, which is organised jointly by the British Electrical Development Association and the Electrical Association for Women, will be held at the Victoria Halls, Bloomsbury Square. Sir Josiah Eccles, deputy chairman of the newly formed Electricity Council, will open the conference with an address on "The Home and the Demonstrator" and Mr. J. I. Bernard, director and secretary of the E.D.A., and Miss Mary George, director of the E.A.W., will speak about the 1958 campaigns of their respective organisations.

"Selling the Electric Home Laundry" will be the subject dealt with in the afternoon. The conference has been arranged to coincide with the Hotel and Catering Exhibition at Olympia, and on 22nd January the delegates will meet at Olympia to hear Mr. H. G. F. Gamble (Eastern Electricity Board, Ispwich) explain "What to See at the Exhibition." E.D.A.'s latest film, "Time for Lunch," will be shown and a demonstration on "Cuts of Meat" by a chef will bring the morning session to a close. The delegates will then be free to spend the afternoon at the exhibition. On Thursday (23rd January) the theme will be "Selling Electric Cooking," and the speakers will be Miss Marguerite Patten and Miss Joan Whitgift (Simplex Electric Co., Ltd.).

A general discussion will take place on the last morning of the conference when the venue will be the Connaught Rooms, Kingsway. The conference will close with a luncheon.



Father Christmas dispensing electrical presents from a "Satellite" forms this display by the G.E.C. at Magnet House, Kingsway, W.C.2

F

Government Lead Disposal

The Board of Trade announced on 11th October that it intended to dispose of its remaining stocks of lead amounting to about 20,000 tons. Discussions have been held with the interests concerned about the rate of disposal. The Board of Trade now invites tenders for the first 7,200 tons for delivery and pricing from 1st January at a rate of 1,200 tons a month. Of this, about 1,900 tons will be offered for sale by open competitive tender and the remainder will be offered to the original suppliers or their agents. Tender forms are obtainable from the Board of Trade, G7A, Room 316, Lacon House, Theobalds Road, London, W.C.1.

Purchasing Seminars

The Purchasing Officers' Association, in association with the European Productivity Agency, is holding a series of Purchasing Seminars in London, Birmingham, Manchester, Belfast and Glasgow during January and February, 1958. They will be conducted by Mr. H. Lee Weber, purchasing consultant to the European Productivity Agency. The fee for attendance at each type of seminar is 3½ guineas per day, including morning coffee, luncheon and tea. Applications should reach the secretary of the Purchasing Officers' Association, Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4, by 31st December next.

Whitworth Foundation Awards

Details of the Whitworth Foundation Awards for engineers to be offered for competition in 1958 have been announced by the Ministry of Education. These are as follows:—Whitworth Fellowships, not exceeding three in number, normally tenable for two years; valued at £500 a year and may be supplemented by dependants' allowances and allowances for travelling. Up to six prizes of £50 each to unsuccessful competitors whose work deserves recognition, to be spent on furthering the competitors' engineering education.

Candidates must be British and either have an engineering qualification of university degree standard or

have a higher national diploma or higher national certificate in engineering with at least two distinctions. In exceptional circumstances a candidate may be in the final year of study leading to one of these qualifications. Each candidate must also have had practical training in engineering totalling 104 weeks. Candidates will be required to write a thesis on a subject approved by the Ministry and may be required to sit a short examination on the basic principles of engineering and to appear for an interview before an examining body.

Hoover Mobile Exhibition

One of three mobile exhibitions of Hoover, Ltd., left Tilbury on 9th December for a 2,882-mile tour of France. Starting at Roubaix on 12th December, it will visit sites in a number of large and small towns and rural areas during a 90-day tour—from the north to as far south as Marseilles, Cannes and Nice and including a short stop in the Paris area. French-made Hoover products will be demonstrated by French Hoover staff and by film shows.

Teachers Confer with Seeboard

A conference attended by fifty domestic science teachers from all the principal schools in and around Croydon, organised by the South Eastern Electricity Board, was held at Electric House, Croydon, on 23rd November. The object was to encourage teachers to make greater use of electrical equipment installed by the South Eastern Electricity Board in schools for instructional purposes and to tell them something about present day developments in domestic electricity. The programme included a display of electrical "switchcraft" during which complete meals were cooked by automatic time-controlled cookers, and clothes automatically washed. "Kitchen Magic" and "Health, Leisure and Pleasure" were the titles for the demonstrations of the newest electrical appliances. A talk on the ring circuit system of wiring was also given.

All-Electric School

St. Ronan's School, Inverleithen, recently opened by Sir Ronald Thomson, Lord Lieutenant of Peeblesshire, is heated by an electric floor warming system and wall panels and five electric storage water heaters are installed with a total capacity of 960 gallons. In addition to lighting, other electrical equipment includes domestic science appliances, hand dryers, woodwork and metalwork equipment, clocks and public address equipment.

Post Office Accounts

The 1956-57 commercial accounts and report of the Post Office have been published by H.M. Stationery Office (price 2s 3d). They show that while there was a general deficit of £3·1 million (against a surplus of £2·3 million in 1955-56), the telephone service had a favourable balance of about £0·1 million (against £4·9 million). There was a net loss of £1·5 million (£1·1 million) on the telegraph account. During the year capital expenditure amounted to £103·2 million, of which telephone plant accounted for £88·2 million, telegraph plant for £2·1 million, and light, heat and power equipment for £2·7 million.

The total staff of 336,663 includes 88,950 in the engineering category. The number of telephones in service at the end of the period was 7,167,000 (a net addition of 337,000) and there were 246,000 (against 344,000) outstanding applications for service.

500,000th Atlas "Popular Pack"

R. A. Poole, Ltd., Coventry, installing new lighting on their premises, opened a carton and found a diploma inside certifying that this was the 500,000th Atlas "popular pack" (dispatched from the Spennymoor factory of Atlas Lighting, Ltd., on 15th October) and that they qualified for the gift of a Ferguson "Fantasia II" radiogramophone. This set has been given by R. A. Poole, Ltd., to the Lord Mayor of Coventry to give to any charity she cares to name.

Iron and Steel Tariffs

An agreement between the United Kingdom and the European Coal and Steel Community on iron and steel tariffs was signed in Luxembourg on 25th November. It embodies the proposals for the reduction of iron and steel tariffs approved by the Council of Association between the United Kingdom and the European Coal and Steel Community at its meeting on 24th October. The agreement will be published and laid before Parliament shortly.

Diary

The Electrical Engineering Radio and Television Diary, 1958, published by H. O. Quinn, Ltd., 151, Fleet Street, London, E.C.4, has 96 pages of technical data, including radio and television. There are four plate pages illustrating television interference and a 16-page coloured road map section. The diary is in two bindings (leather 6s, and leathercloth 5s, post paid).

Railway Resignalling Contract

The contract for resignalling at Newton, Scottish Region, British Railways, has been awarded to Westinghouse Brake & Signal Co., Ltd. The contract involves the complete resignalling of Newton station, together with considerable stretches of track on each side amounting to a total of approximately 26 route miles. The scheme comprises the provision and installation of main colour light signals, Westlyte position light shunt signals, high-voltage d.c. point machines and d.c. track circuits. All functions will be controlled from an "O.C.S." route relay interlocking panel housed in a new signal box which is to be erected at Newton station and which will replace seven existing mechanical signal boxes.

Matthew Hall Exhibition

The chairman of the Matthew Hall group of companies, Mr. B. Baden, M.C., S.B.St.J., M.I.H.V.E., together with his fellow directors, welcomed over 500 guests to their annual cocktail party and exhibition, held on 3rd December at the Dorchester, London. The wide range of activities of all branches of the group was illustrated in the exhibition. Many photographs and models of new buildings were shown and these included air conditioning, heating, sanitary and electrical installations in large office blocks, hospitals, hotels and other buildings at home and abroad. The heavy engineering section included photographs of mechanical, oil refinery and chemical projects. The group's contributions to nuclear power were shown by models and photographs.

Dynamometers for France and Finland

Heenan & Froude, Ltd., have received an order from Chantiers de l'Atlantique, Penhoet, France, for a Froude dynamometer type FA1030 with a capacity of 12,500 b.h.p. at 350/600 r.p.m. Following an order in 1955 for a large Froude dynamometer of 10,000 b.h.p. Wartsila-Koncernen A/B, Helsinki, Finland, has now ordered a Froude type FA4 dynamometer of 1,500 b.h.p. at 565/1,000 r.p.m.

Measuring and Control Apparatus Manufacturers

The annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association will be held on 7th January at the Kensington Palace Hotel, London, W.8.

Industrial Film Production

Film House Productions, Ltd., has made a film in which it shows the type of work which it carries out and the services which it renders; a private showing was given in London last week. The film, which has a running time of about 25 minutes, incorporates twelve excerpts from different productions, showing how varied that work can be. After the showing of the film the selected audience had an opportunity of inspecting the studios, the cutting rooms and the Construction Department.

Automatic Train Signalling

Completely automatic signalling of trains is shortly to be introduced on the in-town sections of the London Transport Northern Line. "Programme machines," developed by London Transport, will carry out all signalling operations for running the

Programme machine for Northern Line signalling

full daily schedule of 900 trains to varying routes and destinations, replacing present manual signalling carried out from three signal cabins at Kennington, Camden Town and Euston. The first stage of the changeover will take place on 15th January.

There will be ten programme machines, and each will signal a complete day's programme of trains in accordance with holes punched in a plastic roll, corresponding to the destination, route and timing of each train.

Tanker Equipment

The Niarchos 40,000 ton tanker, *World Spirit*, which was recently launched at Malmo, will be equipped with a considerable number of Laurence, Scott & Electromotors starters for the a.c. motors. The company has supplied fifty-three starters of standard marine design, mainly of the direct-on type, to control a total of 1,143 h.p.

Londex 21st Birthday

To mark its 21st birthday, Londex, Ltd., has issued a booklet outlining its progress since its formation in 1936. Its many designs of relays and other equipment are also briefly described and illustrated.

Educational

A course of ten lectures, "Introduction to Electronics," will be held on Fridays, commencing on 10th January, in the Department of Electrical Engineering, Liverpool University. The fee for the course is £2 12s 6d and tickets can be obtained from the Director of Extra-Mural Studies, 9, Abercromby Square, Liverpool, 7.

A course of six lectures on "Modern Electric Network Theory and Design" will be held at South East London Technical College on Wednesday evenings, commencing on 22nd January. The fee is 10s.

Two short courses on servomechanisms and magnetic amplifiers will be held next spring at the College of Technology, Bristol. They are intended for electrical engineers in industry and research. The course on servomechanisms will be held on 7th and 8th February, and the course on magnetic amplifiers on 7th and 8th March. The fee for each is £2 2s. Application forms and further particulars can be obtained from the Organiser of Short Courses at the College.

The graduate course in information engineering at the University of Birmingham, of which particulars were issued before the 1957-58 session, will be repeated in the session 1958-59. Applicants wishing to be considered for a D.S.I.R. grant for the session 1958-59, covering the fee of £81 and a maintenance allowance, should apply to the Supervisor of Graduate Courses, Electrical Engineering Department, The University, Birmingham, 15, before 3rd February.

St. Dunstan's

"Blindness Conquered" is the title given to the annual report of St. Dunstan's for the year ended 31st March. Once again the report describes and illustrates the great work which this Institute is doing for the blind, and it thanks all who by their gifts make it possible for this work to go on.

Trade Announcements

Brook Motors, Ltd., is now offering to dealers and other stockists a new novelty showcard, size 15in by 20in, which is a variation on the principle of the "mobile." Supporting material includes a stockist card (15in by 8in) and two posters (15in by 20in) in attractive colours. These may be obtained free of charge from the company's Publicity Department, Huddersfield.

An agreement has been signed whereby the **Pyrene Co., Ltd.,** Brentford, has acquired additional trade marks, patents, sales and manufacturing rights hitherto owned by the American Pyrene Co. It will enable the British company to develop a substantial export market in South and Central America, and a number of European countries, areas where trading has hitherto been restricted.

The **Data Recording Instrument Co., Ltd.,** has taken larger premises at Woodthorpe Road, Ashford, Middx. This move follows the introduction of additional capital into the business by the British Tabulating Machine Co., Ltd. The original board, which included Mr. J. P. Coleman (who will continue as chairman) and Mr. C. Hardy, late of S.R.D.E., Ministry of Supply, has been strengthened by the appointment of three directors from the British Tabulating Machine Co., Ltd. The business will continue to operate as an independent unit.

Black & Decker, Ltd., has formed a new company in Auckland, New Zealand, with the title of Black & Decker (New Zealand), Ltd. The new company is being managed by Mr. J. Smith-Palmer, who has represented Black & Decker in New Zealand since 1955.

The **General Engineering Co. (Radcliffe), Ltd.,** has moved its London office to 5th Floor, 6, Lambeth Road, S.E.1 (telephone: Waterloo 2248). Its Midland office is now at 283, Stratford Road, Shirley, Solihull, Warwickshire (telephone: Shirley 4508). A new office in Scotland has been opened at 15, Moray Place, Edinburgh, 3 (telephone: Caledonian 5597).

The **British Central Electrical Co., Ltd.,** has increased the number of its technical representatives for London and the Home Counties by the appointment of Mr. S. R. Southin (western area) and Mr. G. H. Bates (eastern area).

Mr. R. S. Meggs has been appointed technical sales representative for the instruments division of **Evershed & Vignoles, Ltd.,** for South East England. He will be assisted by Mr. J. V. Gomersall.

Bill Switchgear, Ltd., has appointed Coombe & Bicknell (Pvt.), Ltd., P.O. Box 1782, Salisbury, Southern Rhodesia, as its agents for the Federation of Rhodesia and Nyasaland.

Marconiphone Radio & Television Sales, Ltd., announces the appointment of Mr. T. Harper as representative for the North of England and North Wales area. He was previously with Cossor Radio & Television, Ltd.

Mr. C. Bayley has joined the technical sales staff of the solderless connectors division of **Hellermann, Ltd.**

Calendars and Diaries

The pocket diary received from A. Reyrolle & Co., Ltd., is neatly bound in navy blue soft leather. It contains sectional maps of the British Isles and a number of thumb-indexed pages for addresses.

The calendar of Brook Motors, Ltd., has monthly sheets, each of which has a coloured illustration of customs in various parts of the world.

A picture of the National Gallery, Trafalgar Square, has been selected by the London Electric Wire Co. & Smiths, Ltd., and Frederick Smith & Co. for their monthly calendar.

The Liverpool Electric Cable Co., Ltd., has sent us a calendar bearing a picture of the *Empress of Britain*.

New Year Holiday

The works of Bruce Peebles & Co., Ltd., will be closed for the New Year holiday from 31st December to 6th January.

Stage and Television Lighting Control

By F. P. BENTHAM, F.I.E.S.

Summary by the author of a paper read in London to the Utilisation and Radio Sections of the Institution of Electrical Engineers, on 12th December

A STAGE-LIGHTING installation is fed via a switchboard, the control of which—preferably in the hands of one man—must weld circuits and lanterns into an instrument of artistic expression. A particular feature of these controls is the dimmer which allows the light to be regulated, by dropping the lamp volts, to any degree between 100 per cent (full on) and 0 per cent (blackout). Where the number of dimmers is 36 or over (100 to 200 is common and 300 is about the maximum called for) remote control is essential.

There are two main groups of remote control dimmers now in use:—(a) the electro-mechanical and (b) the all-electric. Group (a) consists of resistance or auto-transformer types which require movement of the tapping arm —movement which was at one time provided by wholly mechanical means such as tracker wires. In Britain for some years a servo which operates a pair of electro-magnetic clutches to connect the dimmer to travel up or down from a variable speed motorised shaft has been common. Group (b) consists of the saturable reactor and its derivatives and electronic dimmers which use two or three thyratron valves to conduct for more or less of the a.c. cycle. Although there are several thousand thyratron dimmers in use, heat losses give them a poor efficiency and have caused present all-electric development to centre on saturable reactors.

Saturable reactors are the obvious dimmers for the smaller installation as the circuitry is simple and they are relatively inexpensive, but above 50 dimmers more complex forms are needed to allow the provision of presetting and other control aids which the rather high control currents of the simple reactor do not conveniently permit. Presetting involves being able to set one or more changes ahead of the lighting actually held in use. Such changes may involve differing intensities on the selfsame circuits and therefore duplicate sets of levers become necessary (Fig. 1).

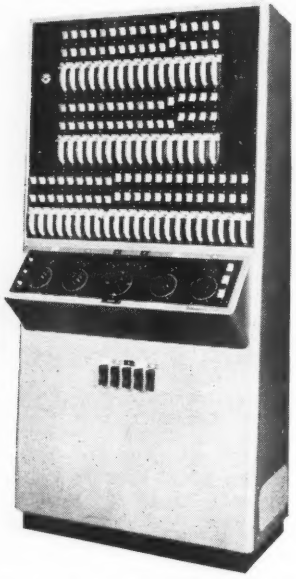


Fig. 1.—Control panel (total capacity 66 dimmers) for saturable reactors with levers giving 1 preset ahead of lighting in use. (Whitehall Theatre, London)

All-electric dimmer systems require to be constantly energised with some degree of control current to hold their station and this means that all the dimmer levels in a particular effect have to be set up on the next preset even if only a few dimmers scattered over the panel actually have to change. Thus a lot of unnecessary dimmer setting becomes essential and this has led to as many as ten repeat levers to each dimmer control. Fig. 2 shows such a control for 80 dimmers for television; where, if anything, the work of setting up for no change is intensified. An electro-mechanical dimmer bank allows of quite different treatment. The control lever for a servo-operated system appears exactly the same as that for an all-electric dimmer, but if the drive is switched off once a dimmer has attained the required level the lever can be reset for the next change. The control in Fig. 1 would then allow two changes to be preset ahead. This inertia of the electro-mechanical system can help still further if, as in Fig. 3, the circuit to the driving clutch to each dimmer is taken through an organ type stopkey. These keys can be readily moved by hand or in groups as memorised on the instantly adjustable combination pistons. A control such as this relies on selection at the stopkeys of circuits to move and the use of a master control to drive the dimmers up or down, and only when a series of complex intermediate levels are necessary do the dimmer levers have to be set. All operations concern changes only and at no time are any controls used to hold any effect, and thus the operator is free to set up for the movement which is to happen next in respect of each circuit.

Fig. 2.—Control desk for 10 presets on 80 magnetic amplifier dimmers. (NBC Television Studio, Brooklyn, U.S.A.)

The various effects for theatre productions are set visually at lighting rehearsal by the producer (and his lighting expert if he has one) while the switchboard operator moves first this dimmer then that. When the effect appears right it is plotted for reproduction at each subsequent performance. In television there is only one

performance and it becomes possible for the lighting supervisor, who is the man directly responsible in this respect for picture quality, to use the control and carry his own lighting right through. The electricians set and focus the equipment in the studio according to his plan, but the actual painting of the final pictures is a matter of switching and dimming, while watching the monitors, and calls for an artist engineer. Although lighting changes during the T.V. show itself will in the main be simpler than those required for the theatre, the demand on the control may be greater because of the lack of time for plotting and to practise changes. The ideal television control must allow the operator rapidly to store within the system a particular lighting set-up and withdraw this for use with the minimum effort at any time. Further, he must be able to modify the set-up immediately if necessary and this works against punched card automation. Intensive activity in the past 2½ years has proved the advantage of the organ type combination action and has shown that the completely different requirements of stage and television nevertheless resolve themselves in remarkably similar controls.

The paper also deals with the subject of patching, i.e. the selection from large numbers of studio circuits of just those required for to-day's production, but this and some of the other television problems will already be familiar to readers of Mr. Bentham's article on television studio lighting in the *Electrical Review* of 19th July last.

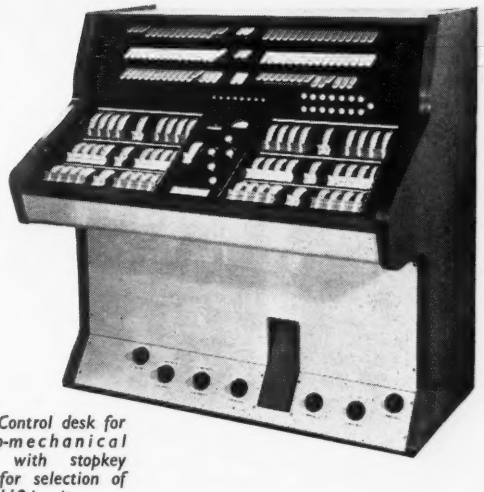


Fig. 3.—Control desk for electro-mechanical dimmers with stopkey controls for selection of 110 circuits

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Ilgner Flywheel Equalising Sets

MR. GEO. BARNARD'S comments in your 29th November issue are much appreciated, and we agree that some reference should have been made to this alternative method, which makes use of an hydraulic slip regulator. On the other hand, it can be fairly claimed that this further alternative has lost favour for this particular application for the following reasons:—

1. In the mining industry, synchronous Ward-Leonard sets will now meet the normal requirements of d.c. winding, without the complication of flywheels. Moreover, the use of grid controlled rectifiers is coming to the fore, and one example is already in service.

2. The h.p. speed requirements of the modern large primary reversing steel mill, such as the one discussed which calls for quick reversal of mill motor and rapid recovery of stored energy in the flywheel, are rather large for hydraulic slip regulation, and are more suited to the use of slip regulation by electrical means.

According to records available to us, hydraulic slip regulators applied in the past for Ilgner duty have been used mainly for mine winders in the range 1,200 h.p. max., but an interesting example has been recently installed in a South Lancashire pit, rated at 2,100 h.p. and described as the world's largest electric winder using the Ward-Leonard Ilgner system with flywheel and hydraulic slip regulator.

There is little difference in efficiency between hydraulic and electrical slip regulation, the slip losses being roughly proportional to the speed reduction required, and the hydraulic coupling is thus perfectly suitable for the smaller h.p. installations. Having, however, introduced a synchronous driving motor for power factor correction, in line with Mr. Barnard's suggestion, we would prefer to go a stage further and to eliminate slip regulation losses completely, by the adoption of straight Ward-Leonard control without flywheel.

On the question of the average life expectancy of rectifier equipment, it so happens that we have recently installed, at the works with which we are associated, some 8,000 kW of grid controlled rectifiers to feed the d.c. motors on a continuous hot strip mill. We expect a life of 10/20 years, and would not hesitate to base our estimates for plant capitalisation purposes on 20 years' life, which is comparable with that of corresponding rotating equipment.

Glass bulb and steel tank rectifiers have been used in Britain for many years on constant voltage duty, and users are now acquiring operational knowledge of the variable voltage types for steelworks use. Large reversing drives fed from grid controlled rectifiers have given satisfactory service for several years on Continental installations, and we have no reason to expect a lower life on this particular application, with well-designed British built equipment.

Sheffield, Yorks. F. L. PARKIN,
D. PEARSON.

System Designation

MANY years ago I was taught to discriminate between an a.c. distribution system and either the loads supplied from it or the source of supply. To me a three-phase system without a neutral or earth return through which load current could normally be carried is a mesh, or delta, system regardless of whether it is derived from a star- or delta-connected transformer or alternator. Only where it is possible to connect single-phase loads at phase voltage, as distinct from line voltage, to the system do I recognise it as a star system.

When this was first explained to me I immediately accepted it as a sensible and logical practice which

was universally understood among my supply company colleagues. After all, one may not always be able to determine the winding arrangements at the supply source, and system characteristics, so far as distribution and loads are concerned, are identical on a three-wire system irrespective of whether it is fed from star- or mesh-connected sources.

To-day I am surprised to find that at least one section of the younger generation of engineers share a conviction that a system is inalienably tied to the winding arrangements at the source. A three-phase three-wire system derived from a star-connected alternator—in which, perhaps, the star point is earthed through an earth leakage protective device, but is not intended as a normal return path for out-of-balance currents—is, to them, a star system. If the star point were not earthed and they were unaware of the internal connections, how could they possibly say?

It is, of course, common knowledge that (*a*) star-connected loads can be supplied from a mesh system, (*b*) mesh systems can be supplied from star-wound alternators and transformers, (*c*) an "earth" for protective purposes may be put on a mesh system by "dummy earth" techniques. These points only stress the argument that systems should be called by their distribution characteristics and not by the winding arrangements at the supply source.

This point does not appear to be mentioned in any textbook that I can find or in the British Standard Glossary of Terms, probably because, in the conventional power distribution systems the "three-phase three-wire" and "three-phase four-wire" conventions fill the bill. There are, however, a number of subsidiary installations in which conditions are not so clear. Aircraft are a case in point. In some cases a mesh-connected alternator is used with one junction earthed; in another a star-connected alternator with one phase earthed and a "floating" neutral; in a third a star-connected alternator with the neutral either solidly earthed to the airframe or through an earth leakage device. Since no aircraft uses a separate neutral return as yet, I hold that only the case with a solid connection between star-point and "earth" ranks as a true star system. All others are mesh systems.

While I would appreciate the views of other readers, I think the time has come for clarification and a considered definition of "star system" and "mesh system" included in the British Standard. Perhaps the I.E.E. and the B.S.I. between them will oblige.

Thames Ditton, Surrey. LIONEL G. HILL.

N.I.C. Membership and Tenders

I READ with great interest your editorial comment, "Towards Safer Installations" (*Electrical Review*, 22nd November). Whilst not doubting for an instant the benefits to be conferred on the public at large by the long overdue needs at present being catered for by the National Inspection Council, there is one aspect of the matter which I find profoundly disturbing.

The implication that non-membership of this body should exclude firms from tendering in the open market smells strongly of autocracy and of the closed shop principle, more so as members have to pay a subscription in order to be enrolled.

Brentwood, Essex. JOHN R. SEAGER.

Pull-Switches for Wall Fittings

WE have been trying to find a supplier of pull-switches of the type that can be used in an electrical wall fitting, such as a wall fire, but as far as we can discover there are no manufacturers in this country who make or market these switches. We are seeking a switch to operate a unit up to 1,000 W on a.c. or d.c. The size of the switch we require is as small as possible, particularly as thin as possible.

We have samples of various types of pull-switches from several Continental countries, and some even from America, but we would prefer to find a source of supply in this country.

The quantities could build up to 500 per week. This pull-switch has no connection with, and is, of course, entirely different to, the ceiling pull-switch.

London, W.3. H. B. FENERON,
Sales Department,
P & R Electrical (London), Ltd.

Food Washing

I MAKE a point of passing the office copy of the *Electrical Review* to my wife, to widen her background knowledge, and she was much impressed by the brief account of the Scottish Modern Homes Exhibition in your issue of 18th October. While the attractions of the washing-up machines had sales appeal for myself, and there were doubts about storage cupboards (are not all cupboards used for storage?), the real impact was made by the "automatic chores units for the mixing, washing and other preparation of food."

Our home in the Middle East is set in an older civilisation, with rather low standards of hygiene, and so the first stage in the preparation of any food is its washing. I fear that if, in fifty years' time, food is to be washed, automatically or manually, after mixing, then the practice of housewifery in the South of Scotland will have taken a retrograde step.

Iran. F. HARDY.

[The "washing" presumably applied to vegetables—before and not after mixing.—Editors, *Electrical Review*].

Surge Diverters

THE surge diverters (lightning arresters) specified in the recently issued B.S. 2914 : 1957 are primarily for protecting high-voltage equipment installed in power stations or sub-stations connected by overhead lines. More specifically, the diverters are of the type which contain a single or multiple spark-gap in series with one or more non-linear resistors for use on a.c. power circuits at system voltages of 1·1 kV and upwards. Lightning arresters are being made the subject of an international recommendation by the International Electrotechnical Commission, and the work of the relevant I.E.C. committee has been taken into account in B.S. 2914.

Two of the three principal sections of the standard are devoted to testing, which is of three kinds: type tests for demonstrating compliance of a given design of diverter with the standard; sample tests made at the purchaser's request on a proportion of the diverters in an order; and routine tests made by the manufacturer on all diverters. The fourth section consists of nine pages of tests and tables specifying in considerable detail the procedure for carrying out seven tests.

To assist users of the standard, the first of the five appendices gives eight pages of guidance on the application of surge diverters. Another appendix, which should provide a useful *aide memoire* for intending purchasers, is entitled "Information to be given to the manufacturer with inquiry or order." Some time must necessarily elapse before surge diverters can be supplied to comply with the standard in all respects; in the meantime, therefore, its application should be subject to agreement between the contracting parties.

Copies of this standard may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 8s 6d.

SMITHFIELD SHOW

THE annual Smithfield and Agricultural Machinery Show, held at Earls Court, London, last week, was the largest in display area ever staged and the number of trade stands (388) was greater than at any previous event. Apart from the animals, always the main attraction at a show of this nature, the emphasis was on agricultural machinery and tractors (nine new tractors were in fact exhibited). But not all farm work is field work and the important part played by electricity was apparent in the improved crop dryers to be seen together with farmstead machinery to ease such jobs as muck handling, movement of feeding stuffs and milk production in all its aspects.

Full-scale layouts on the stand of the British Electrical Development Association showed how electricity is applied to dual-purpose crop drying, platform and in-silo grain drying and barn hay drying, while display matter outlined the advantages and the economics of using electricity for this purpose. Recent developments such as drying in bale, on a platform or in a tunnel were also covered by the equipment shown. A display of samples of this season's barn-dried winter fodder from seven different countries gave visitors the opportunity of assessing the high quality of the products regularly obtained by electrical methods. Equipment for moisture determination and the mechanical handling of grain was also dealt with in a further section of the E.D.A. exhibit.

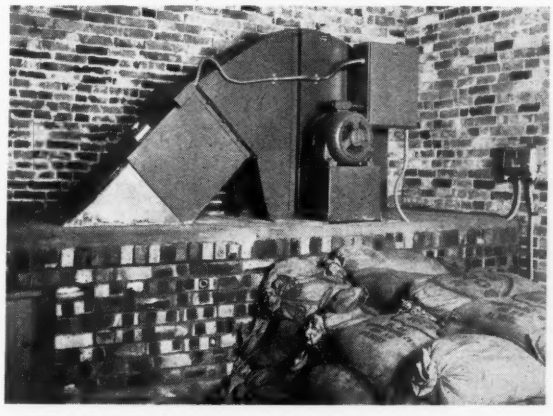
The latest addition to the "Cascade" range of grain dryers exhibited by the Alvan Blanch Development Co., Ltd., is the "Wee" dryer. This has an output of 8 cwt per hour and is especially suitable for the small farmer. Other dryers in the "Cascade" range can be supplied as single units with outputs of approximately 1½ tons (6 per cent extraction) or in batches of two units with three ton outputs. There is also a "Junior Cascade" model with an output of 15/20 cwt per hour which can be either electrically driven or powered by means of a diesel engine or tractor.

The latest addition in the "Lincoln" series (Penney & Porter, Ltd.) is the model 5/20 oil-fired grain dryer, a self-contained unit with an output of one ton per hour. It is available complete with electric motors and electric ignition for the thermostatically controlled firing equipment.

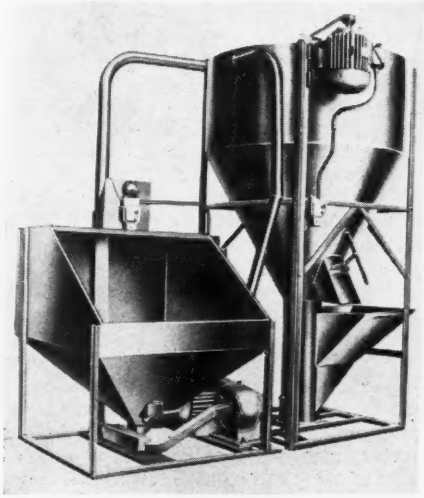
View of the E.D.A. stand showing the grain handling equipment in the foreground

A combined mill and mixer operating on a sealed circuit system without filter bags or other exhauster system has been introduced by Whitlock Bros., Ltd. A 10 cwt capacity mill intake hopper is fitted alongside the mixer and when grinding is complete (about three hours) the mill is automatically switched off. It can also be started up and switched off by hand if preferred and the mixing process takes about five minutes. It is driven by a 3 h.p. motor and incorporates an annular meal duct which ensures that the grain is kept clear at all times. The company also showed a new conveyor suitable for moving grain at the rate of 12 tons/hr, requiring only ½ h.p. for every 25ft run.

Hammer mills ranging in size from the "Little Giant" (2 to 10 h.p.) to the "Super Giant" (30 to 60 h.p.) were shown by Scottish Mechanical Light Industries. Their



B.T.H. 12½ h.p. 3-phase motor shown driving the fan of a "Typhoon" grain dryer



Right: Whitlock combined mill and mixer

latest model, the " Scotmec " " Wee Smasher " is fitted with a ¾ h.p. 7,000 r.p.m. motor. It includes twelve swinging hammers, a two-stage metal eliminator, full-circle screens and unchokeable suction feed. There are no belts or pulleys to cause transmission losses. The new " Ideal " mixer shown by Gordon Felber & Co., Ltd., is a two-in-one machine by virtue of the fact that it incorporates a 16ft " Mayrath " grain conveyor. The conveyor can be simply attached and the machines together provide a highly efficient mixer with a capacity of more than five cwt. A complete mix is achieved in about 30/45 minutes, according to the ingredients. The mixer is fitted with a standard ⅝ h.p. motor.

Much of the equipment to be seen is dependent on the electric motor and the British Thomson-Houston Co. plays a large part in the provision of power drives for the farmer. Included in its comprehensive range of electrical equipment were the now well-known "Stayrite" power drives, consisting of single-phase motors and starters designed as composite units. They are available in ratings from 2 to 5 h.p. and the motors can be either protected enclosure or totally enclosed fan-cooled machines, and either hand operated or push-button contactor type starters can be provided. Other B.T.H. motors suitable for agricultural applications included the KNC ventilated type machines which comply with draft B.S. CW (ELE) 6246. Geared h.p. motor units demonstrated in slow motion and normal speed the efficiency of centrifugal switch mechanism. A 3 h.p. hammer mill and a grain conveyor, both fitted with the company's electrical equipment, were also shown, as well as a special display which illustrated the B.T.H. " Pyroflector " range of infra-red and dull-emitter heaters for pig and poultry rearing. These are now available in 300 and 600 W loadings, the latter with or without pilot light.

Gordon Felber " Ideal " mixer for animal foodstuffs incorporating a " Mayrath " grain conveyor

Research into the problems associated with fuel spray ignition has resulted in the development by Joseph Lucas of a high intensity spark igniter box. It is suitable for the direct ignition of such fuels as diesel oil and kerosene and of a torch to ignite heavier fuels. It is designed for use with a normal single-phase 230/250 a.c. mains supply. The equipment includes a transformer, an igniter and h.v. cable and the weight is 10 lb. The transformer supplies a high voltage to the igniter and a series of h.v. pulses pass through the igniter plug gap in the form of intensive high-temperature sparks, at the rate of four per sec. It is claimed that fluctuations in mains voltage have negligible effect on the spark rate.

Apart from this, Lucas showed many items of electrical equipment and accessories applicable to agricultural purposes including magnetos and lighting equipment for tractors. On the C.A.V. stand electrical equipment included dynamos, control boards, starters, lamps, etc. Among batteries were the new thin-plate high performance type of lead-acid battery with patent porous rubber separators with glass wool pads against each positive plate.

Electrically operated milking machinery was much in evidence and among the many firms that displayed various equipment of this kind mention may be made of Gascoignes whose electronic milking equipment can be supplied on new milking plants or for the conversion of existing plants. The electronic milker works on a pulsation ratio of 3 : 1 and test results show 33⅓ per cent increased milking rate and 10 to 12 per cent increase in yield.

Among refrigeration equipment Prestcold showed several new items including the " Farmoor " open top sales case for prepacked fresh meat and the " Parade " range of self-service sales cases. All have automatic defrosting. There was also a 150 cu ft cold room equipped with the company's patent " Defrostermatic " automatic hot gas defrosting system. Butchers' display cases, conservators for slaughterhouses, milk cooling equipment, low-temperature cabinets, self-service equipment and cold rooms were all to be seen on the Frigidaire stand. At the end of last month Frigidaire completed the manufacture of their one-millionth " Meter-Miser," a sealed rotary compressor unit now used in various sizes to power all their domestic and many commercial refrigerators.

A deep litter turning attachment suitable for fitting to the Tarpen electrically operated hoe-tiller was shown by the Tarpen Engineering Co., Ltd. It consists of an electric motor, driven through reduction gears, rotating tines at the end of a shaft. The 10½in blades revolving at right angles to the shaft are claimed to be able to turn litter to a depth of at least 6in. Apart from this new attachment there were also to be seen chain and circular saws, the " Hedgemaster " farm hedge cutting equipment, and the " Tarpentrimmer " hedge cutter, as well as portable generating sets ranging from 400 W to 3 kW.

Vacuum Cleaner Standard

A BRITISH STANDARD for domestic vacuum cleaners was first published in 1951 as part of a series to promote safety of domestic appliances by specifying appropriate tests and design and constructional details. A new series of tests on the finished product is specified in a revision of the standard just published by the British Standards Institution (B.S. 1645 : 1957).

A typical test is that for " impact strength," which requires that every potentially weak point of the cleaner should be subjected to three blows by a striking element with an impact energy of 4·4 lb/in per blow. Typical points to be so tested are handles, knobs and levers. The test must leave the cleaner undamaged within the specified meaning of that term. Other type tests are provided for accessibility of live parts; test load and loading; temperature rise; leakage current; electric strength; insulation resistance; cord anchorage; earth continuity; switches; and resistance to tracking. To assist manufacturers to design vacuum cleaners suitable for both home and export markets, steps have also been taken to bring the standard more closely into line with the relevant specification for motor-driven appliances issued by C.E.E. (the International Commission on Rules for the Approval of Electrical Equipment). Hence the inclusion of the C.E.E. tests for " impact strength " and " resistance to tracking." Manufacturers who make their products conform with this standard are required to indicate the fact by including the number B.S. 1645 on the name plate, or they may apply for a licence to use the " Kitemark," as one prominent firm has already done.

Copies of the standard may be obtained from the B.S.I. Sales Branch, 2, Park Street, London, W.1, price 6s.

Colour Television

"Flying Spot" Film Scanner

By H. E. HOLMAN, G. C. NEWTON and S. F. QUINN*

(Summary by the authors of a paper presented to the I.E.E. on 11th December)

DESPITE recent experimental transmissions of colour television, there are in this country many questions relating to policy, economy and technique which remain to be solved before a public service can be implemented. However, this domestic inactivity is apparent rather than real and, as an example of the forward thinking which characterises our electronic industry, there is available a complete range of studio, production and transmission equipment. In most cases these units are suitable for any standard specification of colour television signals, e.g. 405-line 50 field/sec, 625-line 50 field/sec, or 525-line 60 field/sec, which are the frequencies currently in force in Great Britain, Europe and America, respectively.

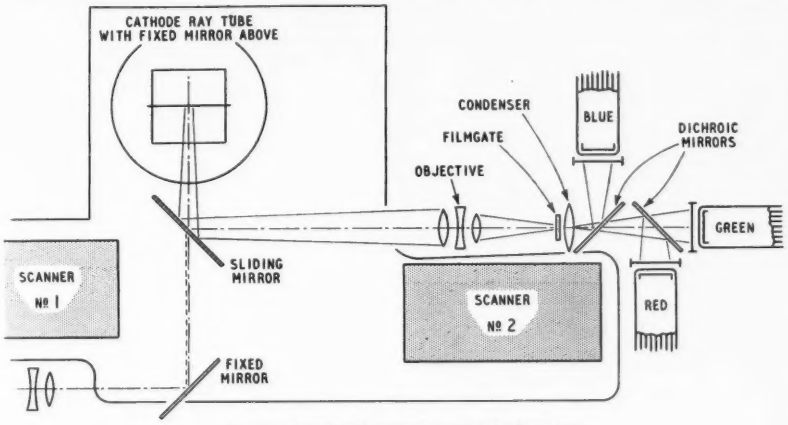


Fig. 1.—Layout of scanners and optical system

Initially, film will be the most important programme source and, relative to studio or outside broadcasts, it will almost certainly be transmitted in an even greater proportion than hitherto. This is because live productions require considerable technical control of lighting and colour balance, which add higher studio costs to the already increased maintenance of more complex station equipment. It is fortunate that a high standard of performance and reliability has already been demonstrated by the equipment which translates into television signals the colour and picture information on cinematograph film.

The "flying-spot" film scanner is already a well-proved device which is extensively used in monochrome television practice. It uses the focused spot of a cathode-ray tube as its source, and employs the vertical component of the scanning sequence to immobilise a continuously moving film. This offers a number of advantages in comparison with the alternative method of using a three-colour camera coupled to an independently illuminated film projector. Perhaps the greatest of these concerns the registration of colour images which, in the case of a colour camera, requires accurate matching of the optical and electronic units of three independent channels. However, in the flying-spot arrangement, only one (white) image requires to be formed, and it is the light transmitted through each element of the film which is analysed in colour and quantity.

A high intensity cathode-ray tube provides the illumination, and its scanned spot is imaged by a lens upon the continuously moving film, Figs. 1 and 6. The first effect of this is to arrest the film motion by a suitable combination of the vertical component of the scan with the uniform linear advance of the film. For this purpose extremely accurate scanning waveforms are generated electronically, and these co-operate with a high precision mechanism for film transport which, incidentally, is available for both 35 mm and 16 mm film gauges. Different television standards are accommodated by producing a series of appropriate rectangular scanned rasters in a sequence which explores each film frame in the manner of an interlaced television picture. The particular aspect ratio and sequence of raster presentation is determined by the field repetition rate, and this may be either 50 or 60 fields/sec in conjunction with a film velocity of 25 or 24 frames/sec, respectively, Figs. 2 and 3.

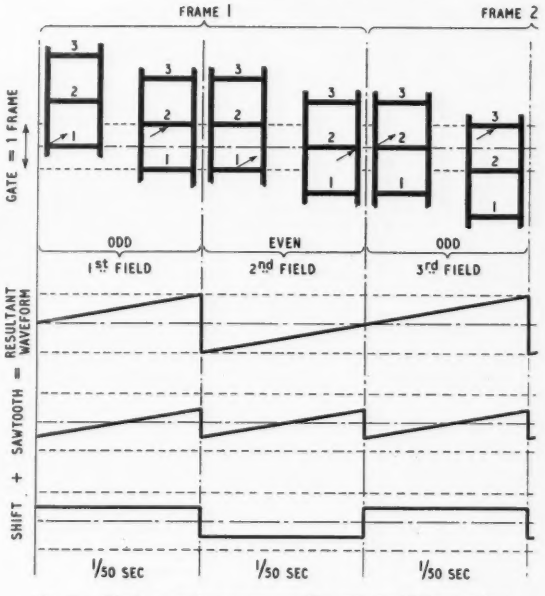
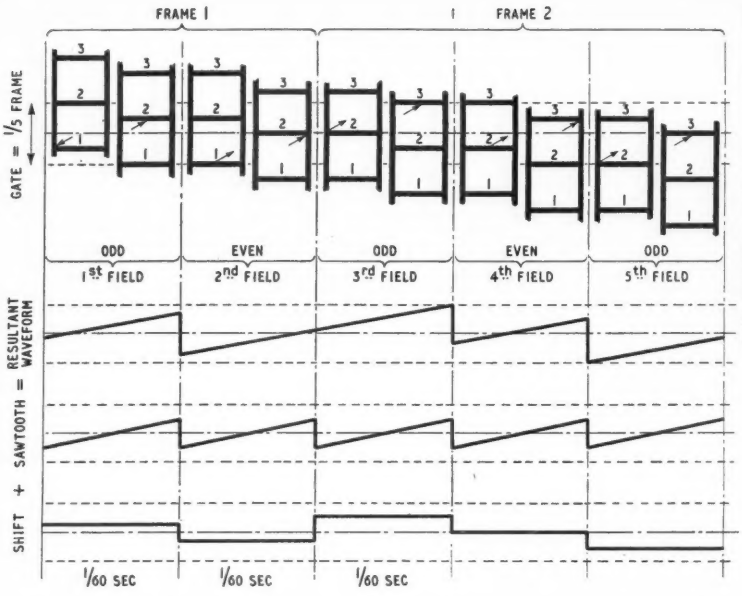


Fig. 2.—50 c/s scanning sequence: film velocity 25 frames/sec

*The authors are with Electric & Musical Industries, Ltd.



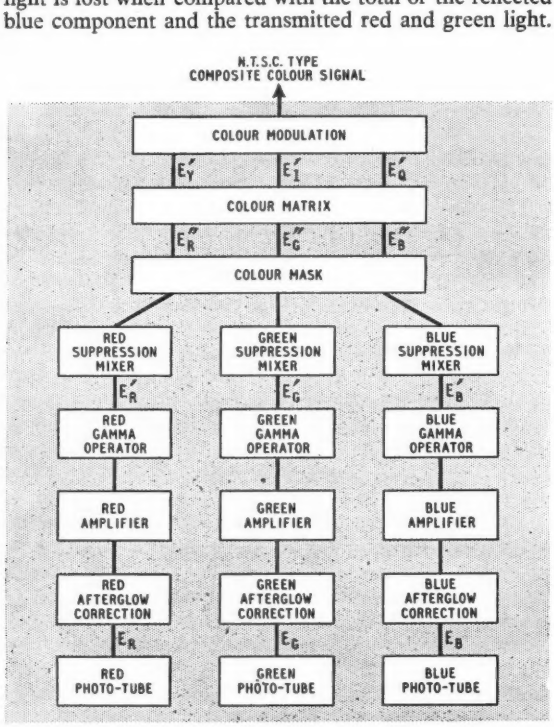
Left : Fig. 3.—60 c/s scanning sequence: film velocity 24 frames/sec. Above: Fig. 4. — Objective, gate and beam-splitter assembly

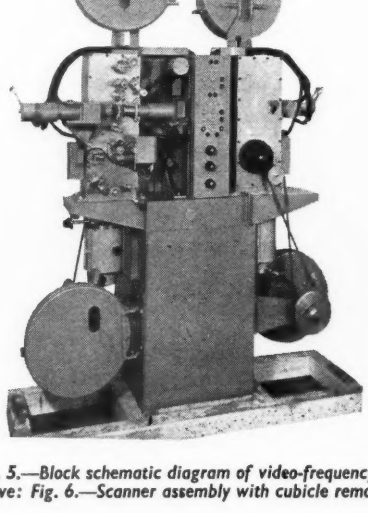
The second effect is to provide a continuous colour and intensity analysis of each frame of the film while it is being explored. Certain components of the white light of the spot image are absorbed by pigments in the film, but the remaining coloured light is transmitted and directed through a beam splitter, Fig. 4. This uses colour selective dichroic reflectors and apportions the light to suitable photomultipliers whose spectral characteristics suit the chosen primary colours. These dichroic mirrors are much more efficient than the combination of colour filter and partial reflector which would otherwise be used and, in one example, only 5 per cent of the incident white light is lost when compared with the total of the reflected blue component and the transmitted red and green light.

This immediate chromatic analysis of each object point provides, as scanning proceeds, signals which are directly related to the colour and information content of the film.

The subsequent treatment of these component signals is demonstrated in Fig. 5. The photomultiplier output signals R, G and B are individually corrected to provide R′, G′ and B′ signals which, with suppression pulses added, enter the " colour-mask " unit. Here a new set of co-ordinates R″, G″ and B″ are derived in such a manner to provide control of hue and saturation of the reproduced colours. This is operationally desirable, since it permits the correction of shortcomings in the rendering of some types of colour film, and also enables more pleasing matches to be made with other sources of colour picture. A composite colour signal, which conforms with accepted standards, is then provided from the colour matrix unit.

In the course of this paper, there are descriptions of some of the electronic, optical and mechanical problems encountered. For example, a steady picture is shown to require co-ordination of the scanning field, of unusual





Left: Fig. 5.—Block schematic diagram of video-frequency circuits. Above: Fig. 6.—Scanner assembly with cubicle removed

accuracy and uniformity, with rigorous mechanical synchronism of the film movement. Distortion and lack of interlace are avoided by presenting every particular part of each film frame to the corresponding points in successive scans at precisely the interval of field frequency.

There follows an outline of the colorimetric considerations which led to the choice of RGB co-ordinates; these provide high-fidelity reproduction of colours with optimum signal/noise ratio and the most profitable utilisation of light. These aspects are then enlarged upon to show how the most suitable types of cathode-ray tube phosphor and photocell materials were employed, and led to the choice of RGB co-ordinates; these were selected on the basis of high-fidelity reproduction of colours, optimum signal/noise ratio and the most profitable exploitation of the available light.

These aspects decide the types of cathode-ray tube phosphor, photocell characteristic and matching dichroic reflector which must be employed. Even so, a slight amount of colour correction has to be applied, and a novel type of built-up filter is described. The overall performance of the equipment is demonstrated on a colour triangle by the presentation of the actual values, and the practical rendering of a number of standard colours. The paper concludes with a description of the controls and the corrections which they apply to the various outputs; the methods of mixing and modulation to produce the composite signal are also mentioned.

In preparing this article, the author has made use of information and diagrams in the paper entitled "A Flying-Spot Film Scanner for Colour Television," which was read before the Radio and Communications Section of the Institution of Electrical Engineers on 11th December.

Select Committee on Nationalised Industries

Report on the Scottish Boards

A REPORT has been published by the Select Committee on Nationalised Industries (Reports and Accounts) together with the proceedings of the Committee and minutes of evidence (H.M. Stationery Office, 11s). The proceedings and minutes cover meetings at which the operations of the North of Scotland Hydro-Electric Board, the South of Scotland Electricity Board and the National Coal Board were considered but the report deals only with the Electricity Boards. With regard to the South of Scotland Board, it is confined to a brief reference to the satisfactory financial position and the fact that nothing was heard critical of the way in which it was carrying out its functions. The Committee feel that further investigation will be more useful after the Board has been in existence for a longer period.

More time was spent examining the 1956 report and accounts of the North of Scotland Board, evidence being heard from the chairman (Mr. Thomas Johnston), general manager (Mr. A. A. Fulton), chief accountant (Mr. A. N. Ferrier) and others. The Committee were impressed by the Board's record of development and say that any criticisms offered are on comparatively minor points "which do not, to any material extent, derogate from the good opinion they have formed of the Board's achievements."

On rural electrification, the Committee were unconvinced by a criticism that the system of common tariffs was unfairly burdening consumers in large towns, pointing out that the Board's tariffs are lower than in Southern England. On the other hand there were complaints that the "credit squeeze" was being used as an excuse for reducing the rate of connection in rural areas. The Committee comment that, being enjoined both to pay its way and provide "so far as practicable" electricity throughout its district, the Board is in a difficult position. They consider that, in existing circumstances, the Board had little option but to restrict its expenditure under this head.

One factor which contributed to the deficit last year was the rise in interest rates, estimated to have cost the Board £270,000. This raised the question of whether the Board was putting too much into its capital investment programme. The Committee say they did not attempt to adjudge whether the Board is placing too much reliance on hydro-electricity, merely pointing out that, on the weight of evidence given to them, the question exists.

Referring to construction costs, the Committee say they examined the list of contractors and were quite satisfied that they were not unworthy of undertaking the important contracts given to them; the Committee were also well satisfied with the quality of the Board's technical advisers.

Three firms which were asked by the Board to set up factories in Scotland for the manufacture of water turbines and water-wheel alternators were each allotted a share of these contracts. The Committee say they appreciate that the Board feels under a moral obligation to provide them with the contracts, but as the firms seem to have established themselves satisfactorily in Scotland the Board should allow them to compete with each other and with other interested firms.

Dealing with the cost of constructional schemes, the report expresses concern over the inaccuracy of estimates and suggests that steps should be taken to prevent a repetition of such errors.

Other matters touched upon include relations with the South of Scotland Board, and the work of the Consultative Council.

Television Studio Lighting

IN the past three years there has been a remarkably rapid development in equipment specifically designed for the television studio. This includes telescopic winches, pantographs and electric hoists for the raising and lowering of lamps, and equipment for the remote switching and dimming of selected groups of lamps from a centralised control desk. It also includes improved and lighter studio luminaires and new systems of plug and socket connections.

A paper presented by Mr. K. R. Ackerman, B.Sc.(Eng.), at a meeting of the Illuminating Engineering Society last Tuesday dealt with studio lighting equipment under three main headings:—(1) Mechanical handling, (2) light control and (3) luminaires and light sources, and analysed the advantages and disadvantages of the types available. In the section on light control a number of different types of dimmer were discussed. The tendency in the United Kingdom had been towards a large number of small capacity dimmers, as giving the maximum flexibility to the lighting man. Control desks had been installed handling up to 200 such dimmer channels, all within finger-tip reach of a single operator. Well over 200 socket outlets might, however, be required in a large studio, and it was usual practice in such cases to have some form of circuit selection, either by cord and jack panels, by relay selectors, or by multiway switches.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

THE effect of the shape of spreader-type insulators on their flashover voltage is explained by the higher dielectric constant of solid insulants, the accumulation of surface charges on the insulator, and to the free mobility of these charges due to the surface conductivity of the insulator. These factors therefore determine the field configuration and, indirectly, ionisation inception. The development of the flashover is determined by the rate of dissipation of the charges deposited from the regions of ionisation around the electrodes. If this rate is slow, surface charges from the previous half-period will still remain after sign-reversal in a.c. operation; these increase field strength at edge of electrode and favour development of small primary discharges. The flashover so initiated obeys the laws of the breakdown of point spark gaps.

Rapid dissipation of surface charges, on the other hand, increases flashover strength. The dissipation of charges depends on surface conductivity as well as on relative directions of surface and field, and this is where the effect of the insulator shape comes in. The comprehensive experimental investigations reported fully confirm these considerations and demonstrate impressively the superiority of insulators with smooth transitions.—" Effect of the Shape of Spreader-Type Indoor Insulating Equipment on their Flashover Characteristics," H. Winkelnkemper and W. Hermstein, *E.T.Z.(A)*, Vol. 78, pp. 561-572, 11th August, 1957, in German.

Parallel Capacitors

An accurate calculation of the transient process on capacitor paralleling, i.e. connection of additional capacitors to others already in operation, is based on the equivalent circuit of two inductively coupled circuits. This leads to a fourth order differential equation yielding two physically significant solutions, i.e. two superposed frequencies of the transient oscillation. Whether both these oscillations fully develop depends on the distribution of the inductive and capacitive reactances, themselves depending on the transient frequencies.

For small ratios of the newly-connected capacitances to those already in circuit, and of the inductance of the branch connected up to the short-circuit kVA of the system, only the higher theoretical frequency will be conspicuous; if the ratios are large, only the lower frequency is significant. In the intermediate range, both frequencies will be effective. The results of the accurate calculation are compared with those of the usual approximative methods (based on single-circuit equivalent diagrams). The conditions under which approximative methods are good enough are established, and correction factors are derived from graphs, to render the results of such approximations more nearly corresponding to experimental facts.—" Transient Processes on Paralleling Capacitors," H. Flöth, *E.T.Z.(A)*, Vol. 78, No. 16, pp. 577-583, 11th August, 1957, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Electric Space Heating

Electric heating has long ceased to be a prevalently technical problem, although progress is still being made in developing special types and appliances for large-scale heating of buildings. Yet the main problem has long shifted to the economic field; it must be admitted that the tariff question is still intimately connected with the technical solution adopted in the layout of the heating installation for any special building. The author investigates the position on the basis of the three types of tariffs (for private consumers) of the Electricité de France which have their parallels in other countries, but the essential differences are brought in by the very interesting development of demand and supply conditions.

At times the supply offered outran the demand (when the big hydro-electric developments took up service), especially in the Alpine Departments (districts). The favourable supply conditions offered at this time made very large electric or " mixed " heating installations for hospitals and the like worthwhile, and some of those described date from this period. When the demand caught up with the supply, the economy of such installations could not be maintained at the previous favourable level; new heating systems, based either on full or semi-storage principles, but also on new radiator types with infra-red radiation, were introduced and in some cases could restore the economic balance. Several concrete examples are analysed and conclusions of general importance are drawn.—" Electric Heating of Buildings," F. Delpastre, *Bull. Soc. Franc. Elect.*, 7th Ser., Vol. 7, No. 79, pp. 387-400, July, 1957, in French.

Oxide-Coat Resistors

The oxide-coat resistors described represent a further development of those originally patented by the Corning Glass Works (U.S.A.) and exhibit very remarkable properties. They consist essentially of SnO_2/Sb_2O_3 deposited from hydrolisable solutions on hot ceramic or glass supports. The coatings possess the hardness of quartz and are therefore mechanically almost indestructible. Their resistivity may be varied from 5×10^{-4} to about 30 ohm-cm, their temperature coefficient from $+0{\cdot}1$ to $-1{\cdot}6\%$ deg C, by varying the technological conditions of production. These resistors are therefore eminently suitable for compensating positive temperature coefficients. By repeated coating of the supports the possible surface loading of such resistors may be increased to about 10 W/cm^2, so that they may be also used as heater elements for special purposes. As heater elements operated at temperatures up to 700-800 deg C their service life is of the order of several thousand hours.—" A Novel Oxide-Coat Resistor with Negative Temperature Coefficient," P. Walter, *E.T.Z.(A)*, Vol. 78, No. 14, pp. 500-504, 11th July, 1957, in German.

Glasgow Traffic Lights

The 100th " Electromatic " vehicle-actuated traffic signal in Glasgow was inaugurated in George Square by Mr. A. Hood, Lord Provost of Glasgow, on 6th December. All the traffic signals in the city have been manufactured and installed by the Automatic Telephone & Electric Co., Ltd., in association with its agents in Scotland, McCreath, Taylor & Co., Ltd.

Combustion Engineering Conference

Boiler House Instrumentation and Nuclear Power Reactor Progress

AT a meeting of the Combustion Engineering Association (Southern Region) in London on 4th December, with Mr. R. Nichol (Arthur Guiness & Sons (Park Royal) Ltd.) in the chair, a paper on the effectiveness of instrumentation for combustion and process work was presented by Mr. R. Clare (National Industrial Fuel Efficiency Service). In the majority of small plants, he said, instrumentation was either non-operative, not fit for service, or non-existent, but no process plant could be run efficiently or its performance analysed without some instrumentation. He referred to one hand-fired Lancashire boiler which, by reason of an adequate but simple instrumentation scheme, was running at an overall efficiency of 75 per cent week by week, on which two manufacturers were unable to guarantee any improvement by fitting mechanical stokers. The engineer and boiler operators were using the instruments intelligently and were trained in their use; all the instruments were in operation.

Case for Instrumentation

In one small firm the N.I.F.E.S. advised that instruments should not be installed, because no one in the firm had the slightest knowledge of how to use or maintain them, but for a large modern boiler plant there was a case for instrumentation from the start. Customers should be shown that a boiler plant could be fully instrumented for an additional 5 per cent, say, which would be recouped in a very short time. Basic essentials were a CO_2 recorder and a steam-flow recorder. In many instances, once a measurement had been obtained, the instrument was no longer required; this made a strong case for the use of portable equipment, on which the whole of N.I.F.E.S. testing services were based.

Where instruments were installed there was normally much more information available than was being used. In one firm several steam meters were installed to break down the total steam load to all individual users. Of a total demand exceeding 22,000 lb/hr, 8,000 lb/hr was required for space heating, but the difference between summer and winter steam loads was only 2,900 lb/hr. Obviously some heating was left on all the year round, indicating a strong case for thermostatic control.

Any of a firm's instruments used by N.I.F.E.S. were always checked beforehand. Managements needed to be aware of the vital role played by instrumentation. This must lead not simply to an allowance in budgets for the purchase of equipment, but to the provision of an additional annual sum for regular maintenance. Until all instrument manufacturers offered a regular maintenance service and provided " off-the-shelf " replacement service, the problems of unserviceable equipment would not be solved.

The chairman listed the following recommendations as a result of the Association's conference at Harrogate on 5th and 6th November:—Instrument manufacturers should have local pools of instruments available for quick replacements; they should pool servicing arrangements to provide a central maintenance organisation; they should design their instruments to withstand rougher handling; the Association should set up a study group to consider minimum standards for instrumentation and the N.I.F.E.S. should be asked to assist. They might produce recommendations which could be implemented without legislation.

Mr. Nichol suggested that the N.I.F.E.S. should interest themselves in a specification for a cheap fuel-air ratio control. He thought that the recording of CO_2 percentages should be abolished, leaving only indications on the scale of " good " and " bad." The mere installation of instruments improved interest in boiler and process plant.

Mr. R. P. Townsend (Elliott Bros. (London)) foresaw the production of a multi-purpose instrument. He said that the spare parts position was now easier. To the minimum instrumentation suggested by Mr. Clare he would add a flue-gas temperature recorder and draught gauge. Mr. K. C. Burrell (Associated Portland Cement Manufacturers) was against legislation for the installation of instruments.

Mr. L. N. Preston (Fuller's Earth Union) asked which was the best CO_2 recorder as regards maintenance—the mechanical, chemical or electrical type. He advocated comparing current charts with those of a year ago to check performance. Mr. Clare replied that once one could get over the sampling problem there was not a great deal to choose between the instruments. The N.I.F.E.S. used the electrical thermal conductivity type, which was easier to set up. Mr. J. S. Williams (William Cory & Sons) said that at the Fuel Research Station, where care was taken to eliminate hazards of sampling, the electrical conductivity method came out best, with which Mr. S. Beeson (Boots Pure Drug Co.) agreed.

Mr. Clare expressed his own preference for the steam-flow/air-flow recorder because it showed the operator immediately any alterations in conditions that called for adjustments, but he had found that the instrument was often set up for a low CO_2 figure and should be checked, possibly by a portable CO_2 instrument.

Mr. Strawbridge suggested that the N.I.F.E.S. should set up an instrument division and provide instrument maintenance, in collaboration with the manufacturers. Mr. L. C. Pike (Electroflo Meters) said that his firm had been running a maintenance agreement for 25 years. But prospective users noted the cost and often preferred to wait until the instrument broke down and then expected repairs for nothing.

Sir Sidney Frew (Ministry of Power) pleaded for the central siting of instruments where the operator could see them. Mr. Clare told Mr. F. T. Ashmore (I.C.I.) that automatic control could be operated extremely successfully on smaller plants, but said it was no use controlling fuel unless air supply was also automatically controlled. It was hoped that cheap automatic controls for shell boilers operating on coal would soon be available.

Graphite-Moderated Reactor

Mr. W. R. Wootton (Babcock & Wilcox), in a paper on gas-cooled, graphite-moderated reactors, emphasised the versatility of the Calder Hall type. Reactors could be designed to-day for electrical outputs up to 500 MW (many times that of Calder Hall) and the capital cost per kW fell as size increased. Superimposed on this was technological improvement, the paramount factor being developments in fuel elements and in reactor pressure

vessel design and construction. Unexpected excess reactivity in the reactors at Calder Hall indicated that much smaller ones could be contemplated, leading to the economic feasibility of small reactor-turbine combinations with an electrical output of only 30 MW or so. The cost per kW might not be unduly high, since higher coolant pressures would be permissible, leading to higher thermal efficiencies which would offset the effect of capital cost.

The versatility of this type of reactor as a means of producing steam for process use was also considerable. The dual-pressure steam cycle enabled a considerable fraction of the total steam production to be at high pressure—say, 30 per cent at 2,000 lb/sq in, provided the remainder could be accepted at a lower pressure. However, it seemed unlikely that process steam demands aggregating less than 500,000 lb/hr from a single nuclear heat source would prove economic. In marine propulsion, a slight enrichment of uranium, such as by increasing to 1 per cent the content of the fissile isotope from the naturally occurring 0·7 per cent, would reduce the size for a 30 MW output from 7,500 cu ft to 2,500 cu ft.

Station net thermal efficiency of a 500 MW reactor would be nearly 29 per cent, compared with 27 per cent for a 1,000 MW reactor. The appreciably higher figure for the smaller plant was directly attributable to the higher coolant pressure possible with a smaller reactor vessel, the limitation in plate thickness of 3in applying in both cases. The smallest reactor for electricity generation for outputs around 30 MW (electrical) might well have coolant pressures of 250 lb/sq in in a cylindrical pressure vessel; the largest, around 300 MW (electrical), might have pressures up to 200 lb/sq in in a spherical vessel. A large station, say of 500 MW output, comprising two reactors, could, however, be built more cheaply than a single-reactor station for half the output.

Uranium was a very cheap fuel; the currently feasible burn-up of 3,000 MWD/ton corresponded to a calorific value of 110 million B.Th.U/lb and the price to less than 1½d per therm. Power station coal at £4 per ton, and a calorific value of 11,000 B.Th.U/lb, cost about 4d per therm.

Higher Temperatures

Progress in the design of nuclear reactors for electricity generation was so rapid that capital costs were expected to fall quickly. In addition, developments in fuel-element technology promised higher burn-up rates. The feasibility of beryllium as a fuel canning material opened the door to operation at higher temperatures. Looking a little further, fuel elements of a ceramic type promised still higher temperatures, enabling supercritical pressure reheating steam cycles to attain thermal efficiencies of over 40 per cent.

For process steam production, flexibility in steam pressures enabled joint schemes for back-pressure power generation and process steam production to receive serious consideration. Typically, a nuclear steam-raising plant producing 550,000 lb/hr, half of which was generated at 1,200 lb/sq in and the remainder at 300 lb/sq in, could turn out 7,000 kW net electrical output and 500,000 lb/hr of process steam at 300 lb/sq in.

In answer to Mr. G. S. Horne (Water Tube Boiler Makers' Association), Mr. Wootton said that reconditioning of fuel would probably be a continuous process in future rather than a batch process, as in the Calder Hall reactor. Replying to Mr. G. S. Ranson (I.C.I.), Mr. Wootton could foresee no difficulty about a reactor for a commercial plant requiring 600,000 lb of steam per hour. If the Central Electricity Authority were bold enough to put such a vast part of their capital development into nuclear power stations, industry should have the courage to do the same. Admittedly, it would be a better guess to say that two nuclear reactors could provide for a plant requiring 1,200,000 lb of steam per hour. On safety precaution grounds he could not foresee a reactor plant being put in the early future into an industrial establishment near a large centre of population.

Mr. Wootton thought that nuclear energy and conventional fuels would continue to be complementary until the turn of the century. Sir Christopher Hinton had always emphasised that the Calder Hall reactor had to be looked at in the light of the Dounreay breeder reactor experiments. Mr. Wootton felt that the hydrogen bomb was an indication that fusion was likely to become a practicability for industrial application. He could not see the application of nuclear energy to small mobile units on account of the heavy shielding needed, but a possibility was the electric car, which had a source of power in the form of nuclear plant in the background. Mr. Vivian Davies asked about an alternative material for shielding. Mr. Wootton referred to experiments with different types of concrete, in laminated water and steel shields and with alloys, e.g. boron-bearing steel. The French had experimented with a pre-stressed concrete vessel, but the most economic approach seemed to be the separate pressure vessel and biological shield. Mr. J. D. Hamilton asked whether the fuel rod could be completely burned out in the reactor, when the disposal problem would be merely one of the cans. Mr. Wootton could not foresee this even in the breeder reactor, for which a closely integrated power and fuel-processing plant was likely to be adopted.

Broadcasting Coverage

AT an informal evening, arranged by the Radio and Telecommunication Section of the Institution of Electrical Engineers on 25th November, a talk was given by Mr. G. Millington on problems of sound and television broadcasting coverage.

The rapid implementing of the B.B.C. plan for f.m. sound broadcasting and of the I.T.A. for commercial television had, he said, carried practical interest from Band 1 into Bands 2 and 3. Problems of increased frequencies would be accentuated by colour television. High-gain aerials would be necessary to obtain large effective radiated powers. Non-uniform horizontal polar diagrams became more important for making the best use of available power in difficult terrain or where the transmitter was not centrally placed.

The separation between stations sharing the same frequency to reduce interference to a really satisfactory level would preclude effective sharing in a country the size of Great Britain, where some unsatisfactory reception would have to be tolerated in order to achieve coverage with the available number of channels. Power restrictions in certain directions would also be required to comply with international regulations. Sound coverage would be subject to the same general limitations.

Harwell Reactor School

THE Reactor School at Harwell is to increase the number of courses to be held each year. Four standard courses will be held instead of three, each lasting sixteen weeks, and there will also be two courses for senior technical executives each lasting nine days. The fee for a standard course is £250 and for a senior technical executives' course £50. Further details can be obtained from the Principal, Reactor School, Atomic Energy Research Establishment, Harwell, Didcot, Berks.

Diploma in Technology

AT a meeting in London last week the first report on the work of the National Council for Technological Awards was introduced by Lord Hives, chairman of the Council. The report emphasises the fact that the Government's plan to produce the necessary supply of technologists through the technical colleges can only succeed if the colleges, industry and the Council are able to pool their experience and ideas and produce suitable courses in the various technologies.

The report describes the work of the Council since it was set up at the end of 1955 to create and administer for technical college students awards of high standard, equivalent, in fact, to university honours degrees. The first step was to issue 18,000 copies of a memorandum setting out the basic requirements of the courses which the Council would recognise. By August this year 83 courses out of 123 applications had been considered, 29 existing courses in nine colleges were recognised as leading to the new Diploma, 20 proposed new courses also satisfied the Council's requirements, and 34 courses were rejected. Consideration of the remaining courses is proceeding rapidly. The Council are convinced that this response confirms the urgent need for a high award for technical college students. Although its insistence on high standards has meant the rejection of a considerable number of courses the Council hopes that developments now taking place at the colleges will enable it to recognise many of them in the near future.

In his foreword to the report, Lord Hives states that on 21st November there were 965 students at 11 colleges attending 37 courses recognised as leading to the Diploma in Technology. Next June, one of these colleges, the Birmingham College of Technology, will establish the second landmark in the history of the Dip.Tech. by conducting the first final examinations.

As part of the procedure for the approval of courses, members of the Council visited and reported on the colleges concerned in order that a "full and serious examination for a just appraisal" could be made. The report states that no single college "satisfied fully the Council's requirements and in some cases good work is being done in singularly unsuitable accommodation. The most common deficiencies are in accommodation for project work and private study, staff work rooms, laboratories for research staff, libraries, and amenities for social activities, but the new building work either now in progress or planned to start in the immediate future, gives firm promise that the majority of these deficiencies will have been met by the time that the renewal of the recognition of courses is considered in five years' time."

The Council is anxious to see that all courses leading to the Diploma not only reach the required standard in a technology but also cover liberal studies and informal activities. To provide for this a large amount of pioneer work has to be done and for the moment the Council is satisfied to accept a statement of the intention of the college on the development of a liberal approach in the curriculum, rather than to insist on the submission of detailed syllabuses in all cases. It hopes that when the recognition of courses is reviewed these studies will have become an integral part of the course.

The Council regards a course leading to the Diploma in Technology as a complete entity, the industrial training being just as much a part of the course as the academic study. The report emphasises that the integration of academic and practical training in industry must be an essential part of any course. It is also considered to be of paramount importance that students shall continue their academic studies during periods of industrial training. Some colleges are attempting to solve these problems by arranging for members of staff to visit students at their place of work while they are in industry.

United Kingdom Electrical Industry and Europe

FAILURE to establish a Free Trade Area would by 1970 result in a loss of some 8 per cent in the output of the United Kingdom electrical industry. This conclusion is reached in the detailed analysis of the impact of the formation of the Common Market on individual British industries, which forms part of the book *Britain and Europe* published this week by the Economist Intelligence Unit, price 15s. The greater sales that would result from the establishment of a F.T.A. would come from the more prosperous home market, higher exports to the Continent, and a more competitive position in other export markets.

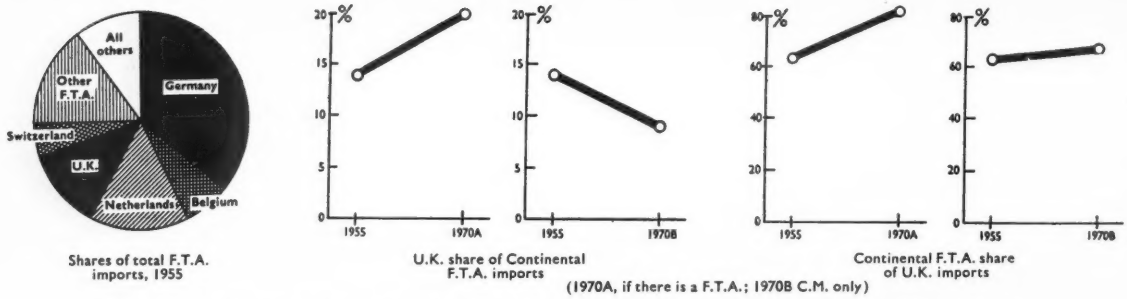
The crux of the problem in a F.T.A. would be to break down the institutional barriers to British sales on the Continent, which, particularly with heavy plant, include the preference of engineers and supply authorities for the products of the industry of their own country, and differing technical standards. In those markets to which British firms have in the past given their attention, their selling has been successful.

It is, therefore, assumed that if a similar effort is made in Europe, the electrical industry, in direct competition with Continental manufacturers and with the whole European market as a base, should keep in the van of technical and commercial progress; if such an effort is not made, or if no F.T.A. is established, the industry's prospects are much less certain.

The book has much that is interesting to say about the relative positions of the British and German electrical industries, costs of production and credit facilities, and on the differing effects that participation in the F.T.A. area will have on large and on small manufacturers and on those whose products are capable of mass production and those where the labour content is high.

In addition to the institutional factors mentioned above it is stated that British exports of electrical equipment to Europe have been inhibited by differences in standards, poor commercial contacts and, consequently, unfamiliarity with the needs of these markets as, for example, in the styling of consumer goods. Also the large safety margins on British heavy plant have tended to make it expensive in relation to its Continental competitors.

It is recognised that one of the most important problems for the electrical industry in a F.T.A. is the question of fair trade. To the extent that the rules to ensure fair trade are not effective, the United Kingdom may be at some disadvantage because the Restrictive Trade Practices



These diagrams from "Britain and Europe" show the estimated trend in the shares of imports of electrical equipment

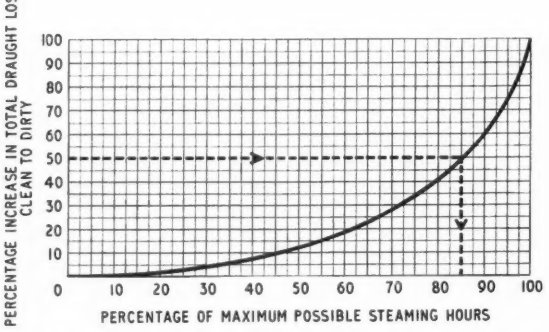
Act is likely to be a more effective instrument than any other national legislation existing in Europe and certainly more effective than the equivalent section of the Common Market Treaty. On the other hand, the authors found evidence that British sales to the Continent have been inhibited by the practice of level tendering, and so far as either the legal provisions of the Treaty or growing competitiveness within the F.T.A. prevent this, British exports should be stimulated. It is, in general, assumed that unfair trade practices will do no more than moderate the growth of trade, hampering exports of heavy electrical plant while those of other goods expand more quickly.

Boiler Plant Cleaning

THE Boiler Availability Committee, now under the chairmanship of Mr. F. W. Lawton, has recently issued its ninth bulletin (MC/286) on "Methods of Cleaning Modern Boiler Plant," copies of which may be obtained from manufacturers of water tube boilers. It is not only a revision of the first bulletin (MC/131), which dealt with the cleaning of stoker fired plant only, but it has been extended to incorporate methods of external cleaning of pulverised fuel fired boilers, as well as stoker fired boilers. Whilst most of the methods described are probably applicable to oil fired plant also, there is no widespread experience in Great Britain with large boilers fired with residual oil fuel, and the Committee therefore recommends caution until further experience has been obtained.

It is generally accepted that an effective way of improving boiler availability is by the thorough cleaning of the heating surfaces and gas passages throughout the plant. In most cases, new boilers are slow to develop heavy deposits and this emphasises the great importance of thoroughly removing all deposits every time a boiler is cleaned.

This point is illustrated in the accompanying graph which



Rate of fouling as determined by increase in draught loss across the boiler plant

is a typical curve showing the rate of fouling as measured by the percentage increase in total draught loss, plotted against the percentage of maximum boiler steaming hours. The draught loss is the most satisfactory practical criterion of the cleanliness of a boiler in service and the zero point on the curve represents the original draught loss across the boiler plant during the initial period of operation when the plant was new. The shape of the curve indicates that the cleaning must be down to the metal if maximum availability is to be obtained. For example, if the plant is cleaned to a point which leaves an excess draught loss of only 10 per cent, some 45 per cent of the possible availability will be lost. In order to use the available labour to the best advantage and to maintain the highest efficiency, it is essential to work at the "clean" end of the curve rather than the "dirty" end and boilers should therefore be taken out of commission for cleaning when the draught loss has reached a figure of, say, 50 per cent on the curve. After this stage the steaming hours remaining are only some 15 per cent of the total and, furthermore, it is obviously easier and quicker to clean a boiler that is only partly dirty than one that is completely choked.

The bulletin is in three sections: the first deals with the nature of the boiler deposits encountered in operation; the second covers cleaning under "on load" and "standby" conditions; while the third section recommends cleaning methods under "off load" conditions. For present purposes, "on load" is defined as any period when the boiler is producing steam, "standby" as any period when the boiler is under pressure but has no steam output, and "off load" as any period when the boiler is out of commission.

Wiring Regulation Interpretations

SINCE September, 1956, abstracts of interpretations of the 13th Edition of the Regulations for the Electrical Equipment of Buildings have been published by the Institution of Electrical Engineers at approximately quarterly intervals. No questions of general interest having been raised since September, 1957, no December list will appear. Reprints of the abstracts so far published are obtainable from the Institution, price 6d each, including postage. The numbers of the regulations concerned are 108, 112(B), 114(B), 115, 203, 204(B), 206(A), 207(G), 209(F), 229(B), 307(A), 314, 315, 316, 401, 403, 404, 405(B), 603(A), Section 8. Tables: C, 1, 7, 16-22. 114(B) (ii), 214(B), 322, 403, 404, 405(D), 407 (iv), 503. Tables: 12-24, 26. General, 110, 115, 208(D), 218, 229, 311, 314, 315, 404, 405(C), 606 (i).

NEW ELECTRICAL EQUIPMENT

Illuminated Switch

The new "Find-a-Lite" switch unit just introduced by NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester, 22, is suitable for all switch positions, but more essentially for points in permanently dark places. It is fitted with a fluorescent coated neon lamp; thus the lamp glows even when the switch is in the off position. It is available for either one- or two-way switching and one- or two-gang grouping. It may be used to replace any existing combined switch and plate unit providing the fixing holes are standard B.S. 1299 centres. The prices of the one- or two-way, one-gang switches in brown are 6s 6d each (ivory 6s 10d) and one- or two-way, two-gang in brown are 13s 8d (ivory 14s).

Mobile Lighting Fitting

A new mobile lighting fitting specially designed for hospital operating theatres is now being marketed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. A 24 V 100 W lamp is fitted which produces a maximum intensity of 1,800 lumens/sq ft. The inclusion of a "Calorex" heat-absorbing cylinder ensures that there is no sensation of heat when working under the unit. The inner reflector is of aluminium with an anodised finish and has a high specular reflection factor.

The fitting, being mounted on a counterbalanced arm, allows a large range of vertical movement to be obtained, while the lighting head can be rotated and tilted to any position. The arm can be moved through an arc of about 330 deg, a stop preventing the cable from being twisted. Instantaneous focusing can be obtained by turning a knob through a small distance. The base of the fitting, which houses a 24 V output transformer, has a small circular cover which gives access to the cartridge fuses. Anti-static rubber castors enable the fitting to be moved easily and silently. The finish is in high quality stoved enamel with chromium parts, and the price is £165.

Fan Heater

A modern styled fan heater, the "Hi-Style," is now being produced by HI-FI, LTD., Derry Works, Derry Street, Brierley Hill, Staffs. It has a maximum loading of 2 kW and is fitted with a four-position switch to give hot air (2 kW), warm air (1 kW), cold air and off. A safety cut-out automatically comes into operation should the heater be tipped over or the air flow become restricted.

The heater is 13in wide by 13in high by 5in deep and weighs approximately 4 lb. A neat carrying handle is fitted and the finish of the casing and the expanded metal grille is hammered gold or silver-grey. The feet and switch knobs are in red. Models are available for 200/220 and 230/250 V, a.c. only, and the price is £7 6s plus £3 4s purchase tax in the United Kingdom.

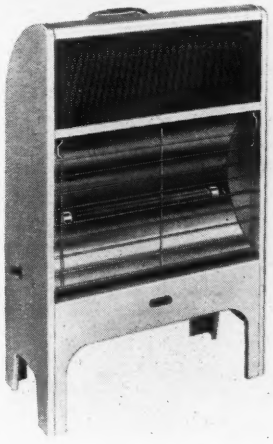
Safety Heater

The "Saferod" high level safety heater first introduced three years ago by HEATRAE, LTD., Norwich, is now available in an improved form. This latest version, model SG2, incorporates a number of refinements, including special finger-tip adjusting screws which allow the angle of the heater to be set to suit individual requirements. The outline of the heater has been improved and a 1 kW embedded rod type element, which has an Inconel sheath to withstand high temperature without deterioration, is employed.

The standard single colour finish is mushroom lustre and the reflector and guard are chromium plated. The price is £4 9s 6d plus £1 19s 3d purchase tax in the United Kingdom.

Radiant Convector Heater

The latest addition to the range of heaters manufactured by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2, is the "Epping"



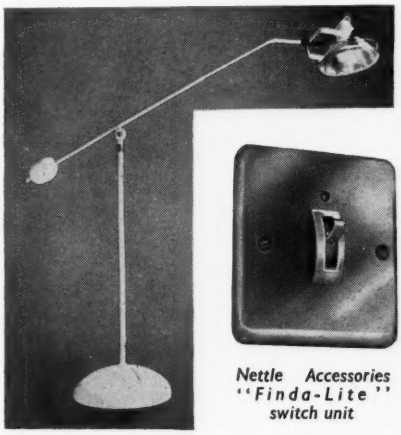
L. G. Hawkins 2 kW "Epping" radiant convector

radiant convector, a model which combines the advantages of a convector heater with the quick heat of the radiant reflector fire. The total loading is 2 kW (1 kW radiant and 1 kW convector) and both sections are separately switched. The heater, which has a standard hammered gold finish, measures 21in high by 13in wide by 6¼in deep. The price is £5 16s 9d plus £2 11s 3d purchase tax in the United Kingdom.

Decade Oscillator

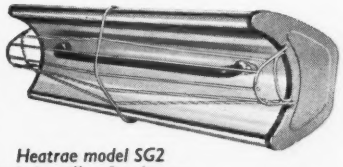
A low frequency decade oscillator capable of producing an undistorted and symmetrical waveform is now available from SHORT BROTHERS & HARLAND, LTD., Castlereagh, Belfast. The amplifiers are continuously drift-corrected so that the d.c. content of the output is normally well below 100 μV and harmonic distortion is less than 0·2 per cent; the amplitude of oscillation is maintained within 1 per cent. The oscillator has provision for generating a voltage step or a ramp function whose rise time is determined accurately by the setting of the three-decade frequency switch.

The oscillation is started by operating a front panel switch to unclamp the amplifiers and apply a step voltage



G.E.C. mobile lighting fitting

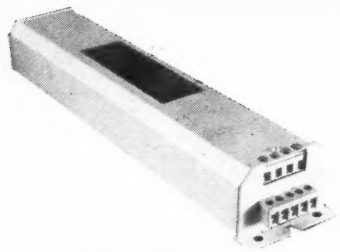
Nettle Accessories "Finda-Lite" switch unit



Heatrae model SG2 "Saferod" safety heater

Right: Hi-Fi "Hi-Style" 2 kW fan heater

The new Crompton Parkinson Christmas lighting set



Midland Coil Winding Co. twin tube ballast

Short's low frequency decade oscillator

Belmos type S9U.2 gate-end box

to the circuit. The sine wave therefore starts from a zero, together with a 90 deg displaced output (or consine) which starts from a maximum value. The frequency of the oscillation is selected by a four-position range switch and a three-decade frequency switch arrangement giving a frequency accuracy within 1 per cent. The oscillator has a frequency range of 0·01 to 110 c/s and can be operated from a mains supply of 210/250 V, 40/60 c/s mains. It weighs 80 lb and measures 21 by 14 by 14in.

Gate-End Box

A new gate-end box introduced by the BELMOS CO., LTD., Bellshill, Lanarkshire, Scotland, complies with the latest N.C.B. Specification for Size 2 gate-end boxes. It is rated at 150 A on a.c. systems up to 650 V and comprises a two-compartment welded steel enclosure, one compartment housing the contactor, protective and relay equipment, while the other accommodates the isolating switch.

The contactor, overcurrent and control relays, voltage and current transformers, etc., are mounted on a removable chassis with plug-in connections for main and auxiliary terminals. As no bolts or screwed fixings are used the chassis can be removed for inspection without using tools.

The contactor magnet, being d.c. operated, allows operation down to 65 per cent of system voltage, and the contactor complies with B.S. 775 : 1956 for Category A.4 duty. The isolating switch is of the load breaking type and will handle up to 1,200 A at 650 V and 0·25 power factor, equivalent to the stalling current of the largest motor likely to be associated with the box.

Protective and control features include overcurrent coils covering the range of 18 to 180 A with a continuous rating of 150 A, intrinsically safe remote control circuit incorporating pilot core protection designed to the requirements of N.C.B. Specification P.130, core balance earth leakage protection together with an intrinsically safe electrical lock-out circuit which prevents operation of the equipment so long as an earth fault persists.

Other features include plug-in type sealed relays for control circuits and simple four-bolt fixing of the main cover. Provision for an ammeter is included and a variety of cable fittings are available to suit customers' requirements and for coupling units together or to other N.C.B. standard equipment.

Twin Tube Ballasts

A ballast for operating two 5ft 80 W fluorescent tubes and one for operating two 4ft 40 W tubes have been introduced by the MIDLAND COIL WINDING CO., LTD., 4, Lancaster Street, Birmingham, 4.

Each unit consists of a transformer start ballast for operating the tubes concerned as a series pair and no earth strip is necessary under normal conditions. If either tube fails then the ballast is inoperative and no high voltages are present. The necessary voltage is not produced until both tubes are operative and as there is only one choke in the circuit the ballast losses are lower than in the conventional two tube ballast.

The units are supplied either as two separate components, i.e. a twin choke and twin starter, or as a combined unit. The only component not supplied unless requested is a 6·8 μF 440 V capacitor. The price of the ballast unit, complete but less capacitor, is £4 10s.

Christmas Lighting Sets

A third design has been added to the range of decorative lighting sets available from CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2, for the Christmas season. The new "Jewel Reflector" sets comprise twelve coloured lamps with richly coloured translucent reflectors of a petal design which enable colour variations to be effected. The sets of lamps are basically similar—12 lamps in assorted colours, with one spare, wired in series with green p.v.c. flexible wire in loop construction, fitted with a b.c. adaptor. The sets are in attractive cartons and ready wired. The other two designs are the "Standard Set" (12 assorted coloured cone shaped lamps) and the "Party Light" set (12 clear lamps with coloured bell-shaped shades bearing nursery rhyme transfers). Packs of 12 spare coloured and clear lamps are available in addition to single spare lamps. List prices are 16s 4d plus 1s 8d purchase tax for the "Standard Set"; 25s plus 2s 6d purchase tax for the "Party Light" set; 26s 3d plus 2s 9d purchase tax for the new "Jewel Reflector" set; and 1s plus 2½d purchase tax each for the spare lamps.

Self-Regulating Alternators

A new range of self-regulating "Magnicon" alternators is announced by the MACFARLANE ENGINEERING CO., LTD., Netherlee Road, Cathcart, Glasgow, S.4. To be known as the "R.S." range, these machines have been designed to meet the need for a self-regulating alternator in the output range 3 to 50 kVA. By adopting Class E insulation and an improved field system a compact machine has been produced.

These alternators embody direct coupled exciters, the exciter armature hub being mounted on a tapered extension of the main shaft. Machines are normally supplied with the control gear loose, for fitting to customers' switchboards, and with 4ft cable tails brought out. Machines can, however, be supplied with a casing on the alternator to contain the control gear and a terminal board.

Fluorescent Fittings

Batten fittings in colours for use with fluorescent lamps have been introduced by H. W. FIELD & SON, LTD., Harold Wood, Essex. This range is available in five standard colours—red, green, biscuit, bronze and gold, and in addition any colour can be matched to order. The fittings are in 5, 4, 3 and 2ft sizes.

PARLIAMENTARY REPORT

Import Duties Bill

The Import Duties Bill was given a second reading in the House of Commons last week. It was welcomed by all who spoke in the debate as a useful simplification of tariff legislation which would help industrialists and those who were engaged at Government level in the negotiation of tariff changes. Nearly all speakers, however, regretted that the Import Duties Board, to be set up under the Bill for investigating applications for tariff changes, would merely advise the President of the Board of Trade, and not make recommendations as the Import Duties Advisory Committee did under the Import Duties Act, 1932.

Sir David Eccles, introducing the Bill, said that in modern conditions that procedure could not be used. The Government had made a series of international bargains which, on balance, were of definite advantage to Britain. Therefore, though the facts of the case for a change might properly be examined by the Import Duties Board, whose reports would normally be published, it would not now be appropriate for this body to make positive recommendations.

Mr. Geoffrey Hirst thought it was not a sound idea to make the Government the sole signatory. There was specific provision for consultation with industry, but it was not clear that industry had the right of direct approach. The Import Duties Board must be independent and be seen to be independent. The power of the Treasury to require payment of fees by persons applying for relief from import duties, or the registration of persons and premises connected thereto, should be reconsidered.

Mr. Eric Fletcher launched a closely-reasoned attack on the Bill's machinery for changing tariffs, saying that at every stage the Import Duties Board was hampered by the restrictions placed on it by the Board of Trade. He hoped they would devise some amendments which would correct the defects in the structure, constitution and duties of the Import Duties Board.

Sir John Barlow reported that in industrial circles there was great concern about what work the Board would do and about its size.

Replying to the debate, Mr. Vaughan-Morgan, Minister of State, Board of Trade, said that with the change in circumstances the new Board could not be the same as the I.D.A.C. which made its recommendations on an appraisal of domestic merits only, paying no heed to external international commitments. The present proposal was that only the chairman and the secretariat should be permanent, and there would be up to 29 part-time unpaid members. The Government hoped that by drawing from the widest range of industry and commerce they would have the benefit of wider experience and technical knowledge than with a full-time professional commission. The Board's reports were to be published, with obvious safeguards for confidential information.

The Bill was given a second reading.

Restrictive Trading Agreements

Mr. F. J. Erroll, Parliamentary Secretary, Board of Trade, moved for the approval of an Order calling up for registration all the classes of agreements which remain to be called up under the Restrictive Trade Practices Act. These are mainly agreements which impose restrictions on the types or quantities of goods to be produced and agreements under which markets or areas are shared between suppliers. He said that such agreements would have to be sent to the Registrar of Restrictive Trading Agreements by 31st March, 1958.

Experience after the issue of the earlier Order dealing with price and trading restrictions showed that registration itself provided an inducement for industries to review critically their own restrictive agreements. It now seemed clear that some were abandoned before registration was due; others were modified or rewritten. From a sample of the agreements the Registrar had deduced that about one-third of the continuing agreements were substantially modified in consequence of the Act. Under that earlier Order 1,400 agreements had been registered. The Government's objective now was to get industry to review the remaining classes of agreement and complete the registration.

Mr. A. J. Irvine said that one of the factors which had lessened some of the pressure on the register had been the decision in the Austin Motor Company case. It was conceded by those who acted for the Registrar that the effect of Section 8 (3) exemption went much wider than some M.P.s thought when they considered the Bill. There was no doubt that a consequence had been that very large-scale exemptions had been conceded to bilateral arrangements made between parties, neither of whom was a trade association. This decision seriously affected the whole object of the legislation. The result was that a monopoly which was sufficiently powerful to do without the aid of a trade association could do almost what it liked in the way of imposing restrictive practices so long as it chose to proceed to do so by way of bilateral agreements.

Sir Lynn Ungoed-Thomas asked for evidence that there had in fact been a diminution of restrictive practices. The Chancellor of the Exchequer was now begging industry to reduce restrictive practices, apparently no longer caring to rely on the inadequate and slow working of the Act. When, for instance, was the first case to be decided? Until that time there would be no evidence that a single restrictive practice had stopped.

Replying to the debate, Mr. Erroll said that he was not in a position to say when the first cases would be heard by the Restrictive Trade Practices Court.

Post Office Finances

In a debate on Post Office finances, Mr. Marples, the Postmaster General, said it had been found that considerable savings in the telephone service could be made by using thinner wires and better telephones, which made up for the loss of signal in the wire itself. It would now be possible to get many more wires into the ducts which ran under the roads. The aim in the telephone exchange itself was to get an all-electronic system, suitable not only for tiny laboratory experiments but such as would withstand all the rigours of day-to-day wear in the public service. In 1960, at Highgate Woods, they hoped to have the first all-electric exchange in operation. The new exchange equipment had been achieved by the Joint Electronic Research Group, known as Jerc.

We had the best network of coaxial cables in Europe, and he hoped that when subscriber-trunk-dialling started there would ultimately be a saving of £15 million a year.

He wanted to see a faster growth in the co-operation between the Post Office and private enterprise in research and development. We could not turn out the working equipment for the electronic exchange as quickly as the rest of the world unless we pooled our research efforts. He hoped to meet the chairmen and technicians of various firms before Christmas to see whether, as Postmaster General, he could take any positive action to assist in the export of modern telecommunications in partnership with private enterprise.

Rating Valuation

Mr. Rippon asked the Minister of Housing and Local Government whether he had yet appointed the Committee foreshadowed in his White Paper on Local Government Finance to review the Plant and Machinery (Valuation for Rating) Order, 1927.

Mr. Brooke said he had appointed a committee, consisting of Sir Edward H. Ritson (chairman), Mr. T. S. Dulake, Mr. A. B. Henderson, Mr. Maurice Lyell and Mr. C. H. Pickworth.

Financial Section

STOCKS and SHARES

IN the Stock Exchange the amount of business passing has shrunk to dimensions smaller than have been known for many years. On the selling side, the extent of the past months' fall in stock prices has discouraged all but routine transactions, while for new investment purposes most of the capital available seems to have been monopolised temporarily by the British Petroleum Company's £41 million debenture issue. In the company news, the feature has been a succession of good earnings and dividend announcements from the steel firms, but political factors affecting the future of this industry have robbed the statements of their effect. Elsewhere, Turner & Newall's declaration of a slightly higher distribution from maintained profits made a good impression. In the electrical equipment market, price changes have again been small and irregular.

Price Changes

In the very quiet conditions of the past week, the shares of some of the principal electrical groups tended to slip further. After declining by a shilling or so, both A.E.I. at 48s 9d and G.E.C. at 38s 9d were back to their lowest prices of the year, and stood on a yield basis of well over 6 per cent. The shares of A. Reyrolle and C.A. Parsons, members of the Nuclear Power Plant Co., were however firm. Automatic Telephone new shares, now 20s paid-up, were a little easier at a premium of 5s 3d on the issue price of 52s 6d, and Ericssons went back 1s 3d to 19s. In the cable group, B.I.C.C. and Henley's lost some ground, but Aberdare picked up to 10s 6d and Scottish Cables to 13s 9d. Brook Motors changed hands up to 35s under the influence of the good results reported in the previous week. Vactric shed a few pence of their earlier sharp rise, but Decca "A" held their recent advance to 26s 3d.

British Electric Resistance

The 2s ordinary shares of the British Electric Resistance company have been changing hands occasionally at prices up to nearly 5s, which is about equal to the best for some years past and puts the shares on an 8 per cent yield basis. It is the company's intention to double the authorised capital, of which £100,000 is at present in issue, in view of a continuous rise in turnover and in anticipation of larger capital requirements. During the year ended last July, greater production and efficiency led to larger sales and net profits. The dividend was maintained at the rate of 20 per cent paid over a long period which included a 100 per cent scrip issue four years ago. In the recently issued annual report the products were said to be in demand and, with the usual reservations, another year of prosperity was anticipated. The annual meeting is to be held next Monday, the 16th.

B.T.M. Dividend

A final dividend of 6 per cent from British Tabulating Machine agreeably surprised the market, where the price

Price Changes in

Company or Board	Nom. Value	Middle price 9th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71½		3	3	4 4 0	80	70
Brit. Elec. 1974/77	100	68		3	3	4 8 3	78½	66
Brit. Elec. 1976/79	100	71¼	+⅛	3⅛	3⅛	4 18 0	81½	70
Brit. Elec. 1974/79	100	82		4¼	4¼	5 3 9	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	18/-	+2/-	6†	6·8†	7 11 0†	19/-	15/-
East African Power	£1	20/-		7	7½	7 10 0	21/-	19/-
Nigerian Elec.	£1	16/6		10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	16/-		10	12½	15 12 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/6	+3d	17½	17½	8 6 9	12/-	9/9
Aerialite	1/-	6/-		48	51½	8 11 9	6/9	4/9
Allen, W. H.	£1	35/-		10	10	5 14 3	47/3	33/6
Anglo-Portuguese Tel.	£1	21/9		8	8	7 7 3	27/6	20/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	48/9	−1/3	15	15	6 3 0	73/-	48/9
Automatic Tel. & El.	£1	57/6		15	17	5 18 3	75/-	54/6
Babcock & Wilcox	£1	59/3	−1/6	15	15	5 1 3	82/6	54/9
Bakelite	10/-	21/3		16	15	7 1 3	24/6	20/9
Baldwin, H. J.	2/-	3/9	+3d	20	20	10 13 3	5/-	3/9
Berry's Electric	5/-	6/-		—	10	8 6 9	6/6	5/6
British Aluminium	£1	42/6	+6d	12	12	5 13 0	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	19/6	+6d	22½	25	6 8 3	25/-	17/-
B.I. Callender's	£1	40/9	−1/-	12½	12½	6 2 9	55/-	40/9
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	42/-	+2/-	9	10	4 15 3	56/3	37/6
British Thermostat	5/-	21/3		25	25	5 17 9	27/6	22/6
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	33/9		25	25	7 8 3	37/6	30/-
Bulgin, A. F.	1/-	4/9		50	40*	8 8 6	5/6	4/-
Burco Dean	5/-	13/9		22½	20	7 5 6	14/-	8/9
Cable & Wireless: Ord.	5/-	10/-		10	10	5 0 0	12/6	9/6
4% Loan	100	90½		4	4	4 8 6	92½	89
Chloride El. Storage "A" ...	£1	59/3	−9d	17½	17½	5 18 3	68/9	55/9
Clarke Chapman	£1	140/-		22½	27½	3 18 6	9	5⅞
Cole, E. K.	5/-	17/6	+3d	17½	17½	5 0 0	23/6	16/6
Cossor, A. C.	4/-	5/3		Nil	2½	2 7 6	7/3	5/-
Crabtree	10/-	24/3		20	20	8 5 0	26/-	23/3
Crompton Parkinson Ord. ...	5/-	15/-		16	16	5 6 9	17/9	14/-
De La Rue	5/-	22/3	−9d	30	35	7 17 3	24/9	16/3
Decca "A"	4/-	26/3		43¾	43¾	6 13 3	32/3	22/-
Desoutter	5/-	31/6		30	32½	5 3 3	35/6	27/6
Dewhurst	2/-	7/-		16½	20	5 14 3	7/9	5/9
Dictograph Tel.	2/-	5/9		20	20*	6 19 3	6/3	5/3
Dubilier Condenser	1/-	3/3	−3d	30	30	—	8/1½	3/3
Duport	5/-	18/3		25	25	6 17 0	21/-	17/-
E.M.I.	10/-	28/9		15	15	5 4 3	36/-	23/9
Electrical Components	5/-	7/3		25	12½*	8 12 6	8/-	6/6
Elec. Construction	£1	23/9		8½	8½	7 3 3	27/6	21/9
Elliott-Automation	5/-	12/6		—	10‡	4 0 0	12/6	10/3
Enfield Cable Ord.	£1	13/3	−6d	Nil	Nil	Nil	21/6	13/-
English Electric	£1	48/9	−1/3	12½	14	5 14 9	65/-	47/6
English Electric 3¾% Pref. ...	£1	12/3		3¾	3¾	6 2 6	14/3	11/3
Ericsson Tel.	5/-	19/-	−1/3	20†	22‡	2 18 0*†	25/-	17/-
Ever Ready	5/-	14/9	−3d	35	37½	6 7 0*	20/-	14/3
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

of the £1 shares was marked up to 42s. It makes for the year a total of 10 per cent, against the 9 per cent rate paid on the three previous occasions. When issuing 800,000 new shares (which do not rank for the present payment) in September, the company thought that over the next year or two profits should permit the maintenance of the former dividend on the larger capital. A further improvement in the net profit from £507,000 to £532,000 (after a much larger tax provision) comfortably accommodates the increase in the dividend, which appears from the preliminary statement to be covered nearly two-and-a-half times over by the net surplus available for distribution and reserves. The yield on the shares goes up to 4¾ per cent, which is still well below the industrial market average by virtue of the big potentialities associated with the future of enterprises in this field.

Electrical Investments

Company or Board	Nom. Value	Middle price 9th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	38/9	−1/3	14	12½	6 9 0	58/9	38/9
G.E.C. 6½% Pref.	£1	20/9		6½	6½	6 5 3	23/6	19/6
General Cables	5/-	12/6		30	30	12 0 0	15/6	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	51/3	45/3
Hackbridge Holdings	5/-	11/9		30	20	8 10 3	21/9	11/3
Hackbridge & Hewittic	5/-	11/3		23	20	8 17 9	16/-	10/-
Head Wrightson	5/-	18/6		20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	11/-	−6d	11½	11½	10 9 0	17/-	11/-
Holophane	5/-	13/-	+3d	30	37½	8 13 0*	15/9	10/3
Hoover	5/-	33/6	+6d	50	50	7 9 3	44/-	24/9
I.C.I.	£1	38/-		10	10	5 5 3	46/6	36/3
Intl. Combustion	5/-	21/-		20	22½	5 7 3	30/-	19/3
Johnson & Phillips	£1	18/9	−9d	15	10	10 13 3	34/6	18/9
Lancashire Dynamo	£1	33/9		11	11	6 10 3	45/9	33/6
Laurence, Scott	5/-	14/9	+6d	15	15	5 1 9	19/9	13/9
Lister, R. A.	£1	25/9		10	10	7 15 3	33/9	23/3
London Elec. Wire	£1	41/3		12½	12½	6 1 3	53/9	40/9
Lucas, J.	£1	28/9	−6d	7½	7½	5 4 3	36/6	27/6
Marconi Marine	£1	30/-	−1/-	10	10	6 13 3	37/-	30/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	47/6		15	15	6 6 3	63/9	47/-
Metal Industries	£1	22/9		Nil	9	7 18 3	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	58/3		20	20	6 17 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/9	+6d	12	12	8 17 9	8/9	5/9
Parsons, C. A.	£1	52/6		8½	7½*‡	—	71/3	45/-
Plessey	10/-	62/6		30	30	4 16 0	86/3	61/-
Pye " A " Deferred	5/-	13/3	−6d	12½	12½	4 14 3	20/-	12/-
Reyrolle	£1	80/-	+2/6	16½	17½	4 7 6	110/-	72/-
Rheostatic	4/-	7/9		18½	12½*	6 9 0	10/-	7/-
Richardsons Westgarth	5/-	14/6		16⅜	16⅜	5 15 0	20/-	13/6
Scottish Cables	4/-	13/9	+6d	27½	27½	7 17 6	19/3	13/3
Simon-Carves	5/-	23/9		28¾	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	14/6		17½	20	5 10 3	16/-	12/9
Southern Areas	£1	11/3		7½	7½	13 16 9	20/-	11/3
Strand Elec.	5/-	6/3		15	15	12 0 0	8/-	5/9
Sturtevant	5/-	18/3		15†	15†	4 2 3†	27/-	18/-
Sun Elec.	£1	43/9		25	25	11 8 6	45/-	42/-
Switchgear & Cowans	5/-	9/9		25	25	12 16 3	15/6	9/9
Taylor Tunnicliff	5/-	11/9	−1/-	15	15	6 7 9	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	24/-	−6d	8½	8½	7 1 9	31/-	24/-
Telephone Mfg.	5/-	5/6		10	10	9 1 9	8/-	5/3
Telephone Rentals	5/-	10/3	+3d	12½	12½	6 2 0	12/6	9/6
Thompson (John)	5/-	25/-		25	25	5 0 0	37/-	23/6
Thorn Elec.	5/-	21/3	+1/3	15	17½	4 2 3	26/3	16/3
Thornycroft	£1	27/6		12½	12½	9 1 9	37/6	21/3
Tube Investments	£1	54/9		13¾	15	5 9 6	70/-	51/3
Vactric	5/-	17/6	−9d	17½	25	7 2 9	23/9	12/9
Veritys	5/-	6/9	−3d	12½	12½	9 5 3	9/3	6/9
Walsall Conduits	4/-	11/6		20	20	6 19 3	15/-	11/-
Ward & Goldstone	5/-	24/6	−1/6	35	40	4 1 9*	29/-	18/6
Watford	2/-	6/-	+3d	25	25	8 6 9	6/9	5/9
Westinghouse	£1	31/3	−9d	18	9‡*	5 15 3	41/3	28/9
West, Allen	5/-	10/3		15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

Holophane Issue

New 5s shares issued to stockholders of Holophane, the lighting specialists, by way of a two-for-three scrip distribution have been dealt in lately at around 13s 3d, and are transferable free of stamp duty while in the form of allotment letters. This operation involves the capitalisation of £100,000 of the company's ample reserves, and raises the issued ordinary capital to £250,000. For the year ended last June, the company reported improved earnings, despite the maintenance of stable prices in the face of increasing costs, and was able to raise the ordinary dividend from 30 to 37½ per cent with a comfortable margin. That rate is equivalent to 22½ per cent on the increased capital ranking for future dividends, and indicates a yield of about 8½ per cent on the new shares at their present price.

Contactor Switchgear

In rising recently to over 15s, the 5s ordinary shares of Contactor Switchgear reached their best price of the year, a notable performance in relation to the general experience among industrial shares. Results published for the year ended in July included a further improvement in the net profit (after a heavier tax charge) from £65,000 to £77,000, which provided for an increase in the ordinary dividend from a total of 18 to 20 per cent. More than two-thirds of the profits are being added to the reserves, which have again reached proportions large enough to provide for the 50 per cent scrip issue now proposed. The latter does not imply larger distributions.

Cable and Wireless

Dividends from Cable & Wireless (Holding), now one of the largest groups in the investment trust world, are paid quarterly and are accompanied by progress reports. For the first three-quarters of 1957 the interim payments have each been 2½ per cent, as in the previous year, and the profits figures have been consistently higher: for the three months ended in September the group earnings (before tax) of £406,000 were more than £50,000 above those for last year's corresponding period. For 1956, dividends totalled 10 per cent, and in his annual review Sir Edward Wilshaw felt reasonably confident that it would be possible to maintain at least that rate for some years to come. At a price of 10s, the company's 5s ordinary shares are on a yield basis of 5 per cent, a return which gives credit to the progressive record of the trust.

REPORTS and DIVIDENDS

Associated British Engineering, Ltd., has declared an interim dividend of 2½ per cent on the ordinary stock of the company (against 4 per cent). The directors state that the earnings of the marine division of the companies have been maintained, but that group profits have been substantially curtailed as a result of losses incurred by the automotive and industrial division, arising from the following causes:—A substantial contract with Egypt was seriously affected by the Suez incident; a large contract for the supply of automotive engines to India has been suspended; and a Government contract absorbing 40 per cent of the output of the principal automotive subsidiary has run out without any present prospect of similar future contracts in view of current Government policies. These factors make it difficult to forecast group trading results for the current year, but there are indications that there will be an improvement in earnings for the year 1958-59 in the light of current improvements in the commercial order book position.

Turner & Newall, Ltd., report a group profit (including miscellaneous income of £927,672) of £13,456,905 for the year ended 30th September last, as compared with £13,343,819 for 1955-56, and after meeting all charges, including £7,599,676 for taxation, the net profit is £5,857,229 (against £5,876,800), to which is added taxation written back of £349,368, and income of £581,353, being profit on disposal of trade investments, making £6,787,950. After making various allocations, the parent company's balance is £4,661,600. It is proposed to pay a final ordinary dividend of 12½ per cent (against 22½ per cent), on doubled capital, making 17½ per cent for the year (27½ per cent).

Hick, Hargreaves & Co., Ltd., has declared an interim dividend of 5 per cent (unchanged).

Scottish Cables, Ltd., is maintaining its interim dividend at 7½ per cent.

Aiton & Co., Ltd., are paying an interim dividend of 2½ per cent (against 7½ per cent) on trebled capital.

New Companies

Wilson-Nicholls, Ltd.—Registered 4th December. Capital £1,500. Electrical engineers, etc. Directors: R. J. B. Wilson and W. O. Nicholls. Regd. office: 24, Market Place, Reading.

Everitts Electric (Cippenham), Ltd.—Registered 4th December. Capital £500. Electrical and electronic engineers, etc. Directors: F. E. Coombs and Gabrielle M. E. Coombs. Regd. office: 7a, Pitts Road, Slough.

Donalds (Electrical), Ltd.—Registered in Edinburgh 4th November. Capital £1,000. To carry on the business of electrical contractors and radio engineersd carried on as Donald's at 29-31, Broad Street, Fraserburgh. Directors: W. J. Donald and A. W. Leggatt. Regd. office: 29-31, Broad Street, Fraserburgh.

L. Beadle, Ltd.—Registered 25th November. Capital £200. Manufacturers of and dealers in radio, electrical and mechanical apparatus of all kinds, etc. Directors: L. Beadle and Mrs. Ethel Beadle. Regd. office: 1a, Greenside, Pudsey, Yorks.

P. G. Day (Electronics), Ltd.—Registered 26th November. Capital £10,000. To acquire the business of an electronic engineer carried on by P. G. Day at 30a, Nightingale Road, Hitchin, Herts, etc. Directors: P. G. Day and P. W. Day. Regd. office: 30a, Nightingale Road, Hitchin, Herts.

Nu-Kleen Electric Appliances, Ltd.—Registered 25th November. Capital £1,000. Retailers, wholesalers, manufacturers of and dealers in vacuum cleaners, cleaning and sweeping tools and apparatus, washing machines, etc. Directors: R. J. Langford and M. Kleen. Regd. office: 26, Goodge Street, W.1.

Electrical Installations Co. (Tottenham), Ltd.—Registered 25th November. Capital £750. Directors: F. W. Wilson and F. G. Cripps. Regd. office: 696, Seven Sisters Road, N.15.

George Platt, Ltd. — Registered 25th November. Capital £1,000. Electrical engineers and general electrical installation contractors, etc. Directors: A. Scholes and G. N. Platt. Regd. office: 1, Longfield, Chesham Road, Bury.

A. Hurrion, Ltd.—Registered 25th November. Capital £500. To acquire the business of an electrical contractor carried on by A. G. L. Hurrion at New Cross Road, S.E.14, etc. Directors: A. G. L. Hurrion and Kathleen D. Hurrion. Regd. office: 45, New Cross Road, S.E.14.

E. Brill, Ltd.—Registered 13th November. Capital £100. Manufacturers of and dealers in fluorescent tubes and fluorescent lighting equipment, etc. Directors: E. Brill and Miriam Brill. Regd. office: 125a, Northcote Road, S.W.11.

Electro Decor Co., Ltd.—Registered 27th November. Capital £100. Manufacturers of and dealers in electrical apparatus and equipment, etc. Directors: B. M. Thomas and Gwynneth H. Thomas. Regd. office: 15-16, Rathbone Place, Oxford Street, W.1.

Hillgate Radio & Electrical, Ltd.—Registered 21st November. Capital £100. Manufacturers of and dealers in radio and television apparatus, etc. Directors: P. H. Strudwick and E. J. Strudwick. Regd. office: Bank Chambers, 1, John Street, W.C.1.

J. Lappin & Co., Ltd.—Registered 2nd December. Capital £3,000. To acquire the business of J. Lappin & Co., electrical contractors carried on at Manchester, etc. Directors: J. E. A. T. Lappin and Mrs. May Lappin. Regd. office: 64/66, Great Ancoats Street, Manchester, 4.

Begbie Taylor, Ltd.—Registered 2nd December. Capital £5,000. Manufacturers and repairers of, agents for and wholesale and retail dealers in artificial lighting apparatus, electrical plant, machinery, fittings and accessories, radio and television sets, etc. Directors: H. A. Taylor, M. A. Taylor, Mrs. Violet L. Taylor, Dr. Marion A. Taylor and A. J. S. Begbie. Regd. office: 83, Park Street, Bristol, 1.

Draycott's Electrical Engineers, Ltd.—Registered 2nd December. Capital £5,000. To acquire the business of electrical engineers and contractors carried on at Stratford-on-Avon as Draycott's Electrical Engineers by D. Draycott. Directors: D. Draycott and Mrs. Monica M. Draycott. Regd. office: "Riverside," Luddington Road, Stratford-on-Avon.

Pickup's (Electrical), Ltd.—Registered 3rd December. Capital £1,500. Manufacturers of and dealers in electrical appliances, etc. Directors: W. A. Pickup, Mrs. Ida Pickup and J. W. Pickup. Regd. office: 51, Fountain Street, Manchester, 2.

John Irving & Sons (Largs), Ltd.—Registered in Edinburgh 5th November. Capital £5,000. To acquire the Largs branch of John Irving & Sons, Ltd., of Glasgow and Largs, electrical engineers and plumbers, etc. Directors: J. Irving and Mrs. J. B. Irving. Regd. office: 3, Lade Street, Largs, Ayrshire.

John Irving & Sons (Glasgow), Ltd.—Registered in Edinburgh 5th November. Capital £12,000. To acquire the Glasgow branch of John Irving & Sons, Ltd., of Glasgow and Largs, electrical engineers and plumbers, etc. Directors: W. Irving and A. G. Campbell. Regd. office: 82, Victoria Road, Glasgow, S.2.

Liquidation

Electrical Power Specialists (Hendon), Ltd. (in voluntary liquidation).—General meetings of members and creditors, pursuant to section 300 of the Companies Act, 1948, on 31st December at Walter House, 418-422, Strand, London, W.C.2.

Bankruptcies

O. E. Harford, Mount Charles Road, St. Austell, Cornwall, electrical contractor and dealer.—Public examination 10th January at the Town Hall, Truro.

E. H. Clegg, Brow Bridge, Greetland, near Halifax, electrical and television engineer.—Trustee, Mr. G. E. Rushton, 36, North Parade, Bradford, 1, appointed 26th November.

R. B. Haill, 132, York Road, Southend-on-Sea, lately carrying on business at 3, Lord Roberts Avenue, Leigh-on-Sea, as an electrical contractor.—Trustee, Mr. W. J. W. Hill, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver, released 25th November.

T. T. Forrest, 123, Windermere Road, Kendal, and formerly carrying on business at 4-6, New Shambles, Kendal, Westmorland, as an electrical engineer.—Receiving order made 27th November on debtor's own petition.

C. R. Clarke, 59, Liverpool Road, Luton, and lately trading at Kingham Way, Luton, electrical contractor.—First and final dividend of 2s in the £, payable on and after 13th December at 6, The Parade, Northampton.

New Zealand's Electrical Imports

Import restrictions and local manufacture caused a decrease of New Zealand's electrical imports from £16·3 million in 1955 to £14·5 million last year. During this period the United Kingdom contribution fell from £12·3 million to £10·5 million. The accompanying table shows, as in previous years, telecommunication equipment, cables and wires and distribution material as leading products.

Product	1956 £ (000)
Motors up to 1 h.p.	468
,, 1 to 25 h.p.	249
,, n.e.s.	82
Generators and magnetos	414
Starters and controllers	200
Switches fuses and conduit	2,004
Transformers and convertors	679
Batteries and cells	191
Lamps	254
Radio and other valves	871
Telegraph and telephone apparatus	1,782
Heaters	242
Flat irons	131
Floor polishers	94
Vacuum cleaners	135
Washing machines	337
Food mixers	377
Dry shavers	166
Meters	290
Electro-medical apparatus	153
Insulators and parts	130
Cables and wires	2,891

GENERATION AND DEVELOPMENT

All-Electric Estates in North-West

The drive to eliminate atmospheric pollution and the growing establishment of clean-air zones have stimulated the development of all-electric housing estates. This pattern of modern living was introduced at Woking, Surrey, where some 300 houses without flues, boilers, fuel stores or chimneys are being constructed at a lower cost than comparable normally heated houses (see *Electrical Review*, 9th November, 1956, page 868). One of the first estates of this kind in the North West is now under construction at Blackpool and a similar estate is to be built in the near future at Manchester. The Woking and North-West housing schemes are centred around the Ferranti "Fridge-Heater," a domestic appliance based on the heat-pump principle which provides constant hot water and cooling of the food larder.

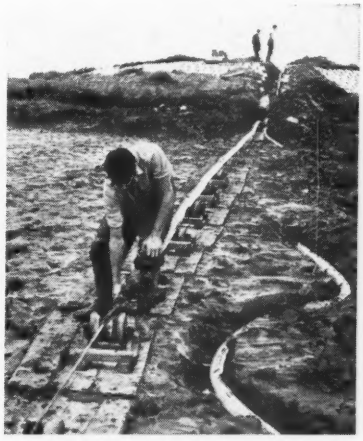
The Blackpool project will consist of approximately 70 all-electric dwellings and of this number about half will also have under-floor heating, for which special off-peak tariffs are available. The installed heating load will be approximately 5 kW for a three bedroomed house. Space heating will be provided by electric fires of both the radiant panel and convector type and also wall mounted fires in the bathrooms and kitchens. The latter are available in a choice of eight colours to blend with the wall colours. The estate is being built by Irvine Brothers, the two- and three-bedroomed bungalows being in the £2,000/£3,000 price range.

Some 70 all-electric houses are planned for Manchester where two sites will be developed, the first at Bowerfold Lane, Heaton Norris, Stockport (14 semi-detached three-bedroomed houses within the £1,885/£2,000 price range) and the second site at Kingsley Road, Heaton Mersey (36 semi-detached and 16 detached three-bedroomed houses within the same price range). The builders are Hampson & Kemp.

Cable-laying in Essex

Power for construction work on the Bradwell nuclear power station is now being supplied by 33 kV overhead lines and underground and submarine cables. This is part of a widespread reinforcement scheme planned by the Eastern Electricity Board in South-East Essex for which some 8,000 yd of Henley 33 kV three-core and single-core screened type cables were recently laid by the company's Contract Department under the direct control of the Essex Sub-Area Engineer's Department.

The cables link together long sections of overhead transmission lines



Preparing to pull the second feeder across Paglesham Pool; the first can be seen snaked in the mud on the right

and were installed in places as far apart as Rayleigh, where 930 yd of three-core and 200 yd of single-core were laid; Rochford, where 470 yd of three-core cable was laid; and Wallasea Island where 7,000 yd of cable was laid in the form of two circuits.

The lack of made-up roads on Wallasea Island, which for the most part is cultivated farmland, imposed limitation on the weight of cable drums, so that the cable in this area had to be laid in 250 yd lengths. In addition, two 310 yd lengths of 0·2 sq in three-core p.i.l.c.s.w.a. and served submarine cable were laid across Paglesham Pool, the cables being pulled across with winch assistance at low tide and then snaked in the mud before finally being buried at a depth of 3ft under reinforced concrete cable covers.

East Midlands Board's Deficit

Mr. John Mould, chairman of the East Midlands Electricity Board, told members of the East Midlands Electricity Consultative Council last week that at the end of the year the Board would have a deficit of about £1 million.

The present accounts would cover a period of only nine months. A new financial year would start on 1st January when the new Central Generating Board and Electricity Council took over. An increase in the price of electricity introduced in October was beginning to take effect and by March the deficit would be practically wiped out.

Supply Schemes

In addition to the reports on progress and development of supplies for the months of August and September, from which it was noted that 4,742 consumers (including 127 farms) had been connected to the supply, the East Midlands Electricity Consultative Council at its last meeting also gave consideration to 49 new schemes already approved by the Board for reinforcing or extending the mains. The new schemes include supplies for 571 new houses and 12 farms and other rural premises, the total amount of capital expenditure involved being approximately £306,000.

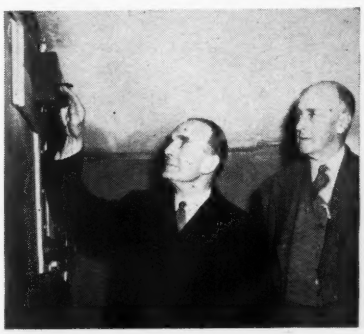
The Council decided to ask the Area Board if they would agree to notices being displayed at the Board's service centres and offices describing the functions of the Council and its Local Committees.

Hydro-Electric Construction

Last week we attended the preview of a 36-minute film describing the Glen Moriston section of the North of Scotland Hydro-Electric Scheme, which had been made for the main contractors, Mitchell Construction Co., by Verity Films, Ltd., in association with the Film Producers' Guild. The film was exceptionally well produced and full of interest and described the Glen Moriston scheme right from the preliminary surveying to the completion of the project, and included some very good sequences dealing with the tunnelling work involved. Copies of this film are available in black and white and either 35 mm or 16 mm from Sound Services, Ltd.

Donegal Turf-Burning Station

A new turf-burning power station at Gweedore, County Donegal, is to start production early in January. It will consume some 300,000 tons of hand-won turf annually.



Mr. T. E. Daniel, chairman of the North Western Electricity Board, switching on the supply to the 20,000th farm to be connected in the Board's area. With him is Mr. T. G. Gregson, owner of the farm, Lower Starbank, Dolphinholme *(see "Electrical Review," 29th November, page 1001)*

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 18th December from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

4809. Schwarzer, F.—Method and apparatus for recording signal voltages, particularly of physiological origin. 20th February, 1953. (787743.)

10119. National Research Development Corporation.—Electric pulse translation stages. 8th April, 1954. (787982.)

17229. Sparcatron, Ltd., and Rudorff, D. W. A. F.—Apparatus for cutting electrically conductive material. 22nd June, 1954. (787732.)

1954

7329. Hooker Electrochemical Co.—Electrolysis process. 12th March, 1954. (787976.)

10549. General Electric Co., Ltd., and Jeans, G. L. G.—Transductor arrangements. 30th March, 1955. (787987.)

10710. Levin, S.—Method and apparatus for reproducing magnetic signals by means of a cathode-ray tube. 12th April, 1954. (787988.)

14715. Bader, A. F., and Soos, F.—Apparatus for feeding lengths of wire for use in the manufacture of electric lamps. 23rd March, 1955. (787952.)

23129. E.R.A. Patents, Ltd.—High-vacuum electric circuit-breakers. 9th November, 1955. (787846.)

22106. General Electric Co., Ltd., and Robins, W. P.—Automatic frequency control of electric oscillation generator systems. 26th July, 1955. (787901.)

26458. Automatic Electric Laboratories, Inc.—Multiple frequency generator. 13th September, 1954. (787805.)

26617. Westinghouse Brake & Signal Co., Ltd., King, K. G., and Eastop, R. H.—Apparatus for automatically controlling the current in an a.c. circuit. 24th August, 1955. (787903.)

29320. Ferranti, Ltd.—Electronic selector stages. 29th September, 1955. (Cognate application 34991, 3rd December, 1954.) (787905.)

29711. Electric & Musical Industries, Ltd.—Colour television. 17th October, 1955. (787806.)

30335. Cinema-Television, Ltd.—Pulse signal delay circuits. 18th November, 1955. (787956.)

31655. Telephone Manufacturing Co., Ltd.—Electromagnetic relays. 31st October, 1955. (787996.)

32404. Westinghouse Brake & Signal Co., Ltd., and Watson, T. F. E.—Dry contact rectifier assemblies. 21st October, 1955. (787807.)

33279. Westinghouse Brake & Signal Co., Ltd., and French, E. L.—Moisture-proofing of apparatus, e.g. small electrical components, comprising metal parts. 21st October, 1955. (787957.)

34265. Automatic Telephone & Electric Co., Ltd.—Metering equipment for use in telephone systems. 17th October, 1955. (787998.)

1955

578. General Electric Co.—Electrolytic oxidation of copper. 7th January, 1955. (Addition to 761372.) (788002.)

4004. Babcock & Wilcox, Ltd.—Electric arc deposition of metal and electric arc metal deposition apparatus. 10th February, 1955. (787910.)

13485. Standard Telephones & Cables, Ltd.—A.c. regulating devices. 10th May, 1955. (787837.)

15371. Mullard Radio Valve Co., Ltd.—Electric rectangular-wave generator circuits, relaxation oscillator circuits, and monostable circuits. 30th May, 1956. (787917.)

15844. Marconi's Wireless Telegraph Co., Ltd.—Wave guide mouth structures for projecting beams of electromagnetic waves. 6th March, 1956. (787756.)

16483. General Electric Co.—Mass spectrometers. 8th June, 1955. (787962.)

20336. Metropolitan-Vickers Electrical Co., Ltd.—Cable devices. 27th June, 1956. (787765.)

22552. Allmänna Svenska Elektriska Aktiebolaget.—Voltage divider for high voltage ionic valves. 5th August, 1955. (787868.)

23835. Mullard Radio Valve Co., Ltd.—Wave-guide windows. 18th August, 1955. (787925.)

24906. Marconi's Wireless Telegraph Co., Ltd.—Power line fault protection systems. 22nd May, 1956. (788015.)

24913. Sylvania Electric Products, Inc.—Application of strip coating to cathodes. 30th August, 1955. (787926.)

27162. Pritchett & Gold & E.P.S. Co., Ltd.—Manufacture of electric batteries. 9th August, 1956. (787872.)

28946. Collins Radio Co.—Parasitic oscillation suppressor. 11th October, 1955. (787929.)

29902. Deutsche Edelstahlwerke Akt.-Ges.—Electric induction heaters. 19th October, 1955. (787874.)

33063. Standard Telephones & Cables, Ltd.—Travelling wave electron-discharge devices. 18th November, 1955. (787777.)

33869. Compagnie Générale de Télégraphie sans Fil.—Delay lines for travelling wave tubes. 25th November, 1955. (787823.)

34285. Imperial Chemical Industries, Ltd.—Electric fuseheads. 14th May, 1956. (788025.)

34409. Philips Electrical Industries, Ltd.—Methods of providing a semi-conductive body of cadmium-telluride with a tellurium layer. 1st December, 1955. (787935.)

36452. Western Electric Co., Inc.—Circuits including electric signal transmission lines in communication systems. 20th December, 1955. (787824.)

37299. Collins Radio Co.—Variable band width intermediate frequency system. 29th December, 1955. (787826.)

1956

938. National Cash Register Co.—Waveform shaping circuit. 11th January, 1956. (787939.)

1099. Jeru, H.—Electric furnaces. 12th January, 1956. (787965.)

2453. Philco Corporation.—Tunable electrical amplifier stages. 25th January, 1956. (787881.)

6416. Standard Telephones & Cables, Ltd.—Unidirectional waveguide attenuator. 1st March, 1956. (787943.)

6573. Allmänna Svenska Elektriska Aktiebolaget.—Electricity supply systems. 2nd March, 1956. (788033.)

9136. Philips Electrical Industries, Ltd.—Automatic signalling systems. 23rd March, 1956. (787945.)

15701. Square D Co.—Control system for, and a method of, controlling a plurality of d.c. motors. 22nd May, 1956. (788042.)

16525. Square D Co.—Automatic electric circuit-breaker. 29th May, 1956. (788044.)

16822. Standard Telephones & Cables, Ltd.—Electron velocity modulated tubes. 31st May, 1956. (787797.)

17971. General Electric Co.—Thermally protected multi-speed electric motors of the single-phase a.c. induction type. 11th June, 1956. (788046.)

18972. Commissariat a l'Energie Atomique.—Discharging rods of fissionable material from nuclear reactors. 19th June, 1956. (787971.)

1957

11492. Standard Telephones & Cables, Ltd.—Electrical power supply equipment. 10th May, 1955. (Divided out of 787837.) (787838.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 20th December:—

SPARCARD. No. 765,767. Class 7. Electric alternators, generators, erosion machines, disintegrators, electrical machines, for use in depositing metal; machine tools and tools for use therein; and parts.—Sparcatron, Ltd., Abbey Yard, Bath.

No. 761,600 (design). Class 9. Nautical, surveying, optical, measuring, signalling, checking (supervision) and teaching apparatus and instruments; and scientific, electric and electronic apparatus and instruments; but not including sound recording and sound reproducing instruments.—Microwave Instruments, Ltd., West Chirton Industrial Estate, North Shields.

DEAC (design). No. 762,834. Class 9. Electric cells and electric batteries and parts.—Deutsche Edison Akkumulatoren—Company, G.m.b.H., Frankfurt-am-Main, Germany. Address for service, c/o Edward Evans & Co., 53-64, Chancery Lane, London, W.C.2.

MINI-NOISE. No. 763,944. Class 9. Electric cables.—Microdot Inc., South Pasadena, Cal., U.S.A. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

ALKROTHAL. No. 764,111. Class 9. Electrical conducting and resistance material of heating resistant alloys in the form of wire, strips, rods and tubes; and electrical regulating resistances.—Aktiebolaget Kanthal, Hallstahammar, Sweden. Address for service, c/o Pollak, Mercer & Tench, 134, Cheapside, London, E.C.2.

No. 764,301 (design). Class 9. Switches, coils, modulators, demodulators, oscillation generators, current rectifiers, apparatus for use in the cathodic protection of metal converters, discharge tubes (not for lighting purposes), batteries, transistors, condensers, insulated cable and insulated wire; electrotechnic apparatus; telecommunication apparatus and instruments, loudspeakers, alarms, signalling apparatus, telephone and loudspeaker apparatus, apparatus for intercommunication, public address apparatus, automatic voltage regulators; electric and electronic installations for use in the collection, assembly, storage and furnishing of data and statistical information; electric and electronic installations for use in the supervision, checking and control of industrial operations and in the calculation and furnishing of data and statistical information; and meters and optical apparatus and instruments. — Standard Elektrik Akt.-Ges., Stuttgart-Zuffenhausen, Germany. Address for service, c/o E. B. Robinson, Connaught House, 63, Aldwych, London, W.C.2.

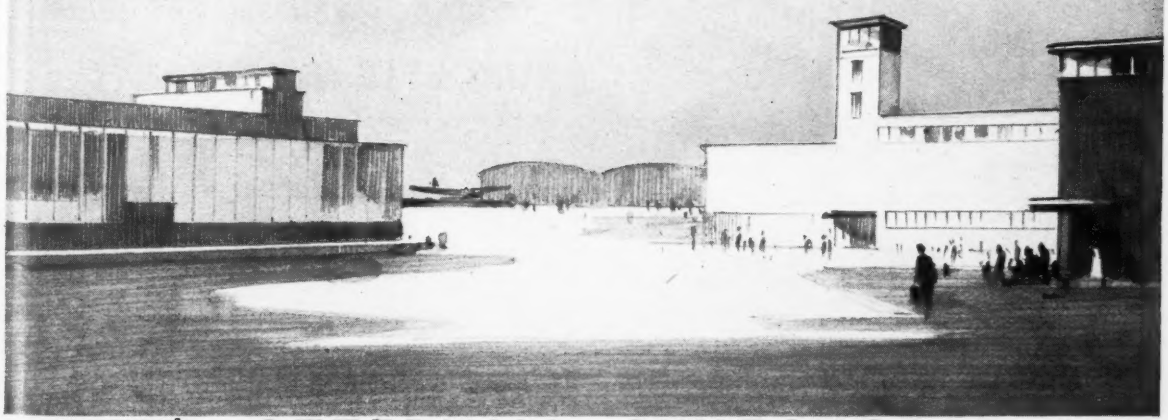
SILVERLAC. No. 766,951. Class 9. Electric conduit material and electric conduit fittings.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

LIGHTOLIER. No. 767,693. Class 9. Electrical apparatus.—Cantenac, Ltd., 4, St. Bride Street, Ludgate Circus, London, E.C.4.

FERROMAX. No. 768,624. Class 9. Electrodes for electric arc welding.—Quasi-Arc, Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

M·CROCERAM. No. 768,702. Class 11. Nuclear reactors; installations for processing nuclear fuel and nuclear moderating material; fuel cans (charged or uncharged) for use in nuclear reactors; heat-exchangers (not parts of machines); and parts.—Microcell, Ltd., Imperial Buildings, 56, Kingsway, London, W.C.2.

We don't supply aircraft . . .
but we *do* supply Ottermill Switchgear
for the control of airfield electrical services
all over the world. Our range
includes Industrial and Cubicle type
switchboards, plug-in trunking systems
and other equipment suitable
for general industrial requirements.

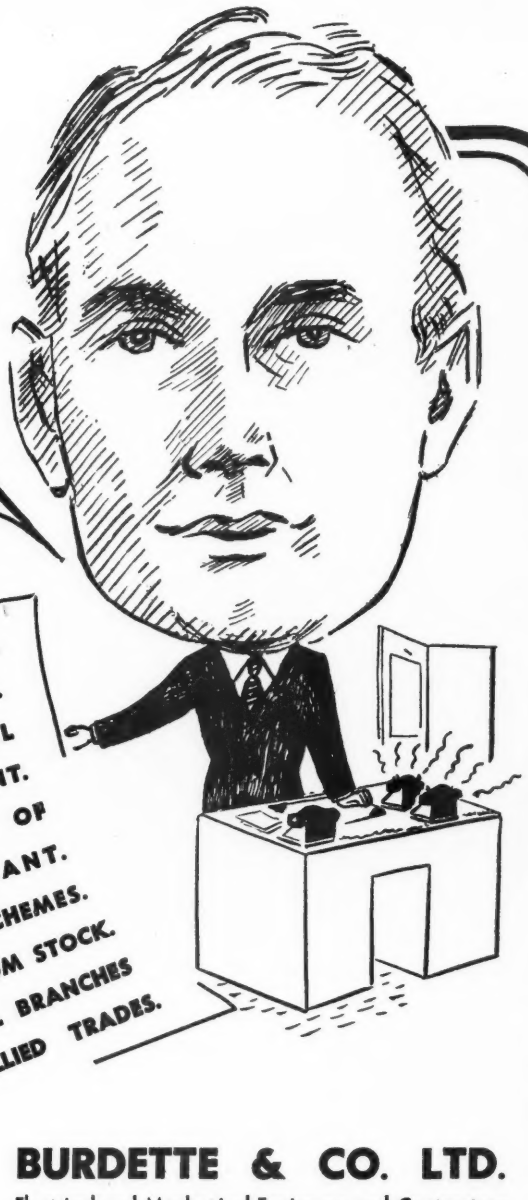


OTTERMILL SWITCHGEAR LTD

***SALES OFFICE:* 1 VICTORIA STREET LONDON SW1**

Telephone: ABBEY 5095/6 Telegrams: BUSBAR SOWEST

WORKS: OTTERY ST. MARY DEVON *TELEPHONE: OTTERY ST. MARY 264* *TELEGRAMS: BUSBAR OTTERY ST. MARY*



Our organisation is at your disposal

LIGHTING AND POWER INSTALLATIONS.
COMPLETE INDUSTRIAL ELECTRIFICATIONS.
REPAIRS AND REWINDS OF ALL TYPES OF ELECTRICAL EQUIPMENT.
INSPECTION AND MAINTENANCE OF ALL TYPES OF ELECTRICAL PLANT.
HEATING AND VENTILATION SCHEMES.
ELECTRIC MOTORS AVAILABLE FROM STOCK.
ELECTRICAL SPECIALISTS IN ALL BRANCHES OF THE PRINTING AND ALLIED TRADES.

BURDETTE & CO. LTD.
Electrical and Mechanical Engineers and Contractors

Head Office:
150 CLAPHAM MANOR STREET
LONDON, S.W.4
MACAULAY 4555 (P.B.X.)

Main Works: STONHOUSE STREET, S.W.4

Branch Works:
219 Blackfriars Road, S.E.1. Waterloo 4572
OFFORD STREET WORKS, N.1. North 4031

BURDETTE'S
Electrical Services

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Southern Electricity Authority of Queensland, Brisbane. 29th January. Two 60 MVA transformers. (E.S.B. 28979/57. Ten/29607.)*

Burma.—Burma Purchase Board. 23rd December. Armature and instrument winding wires. (E.S.B. 29424/57. Ten/29682.)*

Fermanagh.—County Education Committee. 2nd January. Electrical installation in new secondary intermediate school, Ballinamallard. McAuslan & Abbott, consulting engineers, 16, Bedford Street, Belfast.

Formosa.—Central Trust of China, Taipei. 31st December. Mechanical disc rectifier and two mercury arc rectifier equipments. (E.S.B. 28655/57. Ten/29560.)*

Hertfordshire.—The County Council invites applications for inclusion in its list of contractors for building and maintenance works, including heating and electrical work. (See this issue.)

Heston and Isleworth.—Corporation. 8th January. Street lighting equipment. (See this issue.)

Iceland.—Sogsvirkjunin, Reykjavik. 20th December. H.v. transmission cable and equipment. (E.S.B. 29194/57.I.C.A. Ten/29629.)*

Ilford.—Borough Council. 6th January. Supply of g.l.s. electric lamps for one year (Form No. 16). Borough engineer, Town Hall.

India.—Madhya Pradesh Electricity Board, Nagpur. 2nd January. Three 55,000 lb/hr boilers and ancillary gear for Satna power station. (E.S.B. 28565/57. Ten/29539.)*

Hindustan Steel (Private), Ltd. 6th January. Two 3,000 kVA and six 2,000 kVA transformers. (E.S.B. 28566/57. Ten/29541.)*

Madras State Board. 25th December. L.v. shackle insulators. (E.S.B. 29231/57. Ten/29519.)* 7th January. 11 kV reactor for Basin Bridge power station. (E.S.B. 28925/57. Ten/29587.)*

Iran.—Organisation du Plan, Teheran. 19th January. Material for h.v. and l.v. distribution networks, Ghazvin. (E.S.B. 28260/57. Ten/29581.)*

Iraq.—Central Foreign Purchasing Board, Baghdad. 1st January. Electrical laundry plant. (E.S.B. 29149/57. Ten/29620.)*

London.—Holborn Borough Council. 31st January. Street lighting lanterns and columns. (See this issue.)

Finsbury Borough Council. 6th January. Supply of electric lamps for one year from 1st April, 1958. Borough engineer, Finsbury Town Hall Annexe, Rosebery Avenue, E.C.1.

Manchester.—Corporation. 30th December. Electrical installation in Irwell College for Further Education. (See this issue.)

Merton and Morden.—U.D.C. 2nd January. Street lighting equipment. (See this issue.)

Middlesex.—County Council. 31st December. Electric lamps and fluorescent tubes for the year ending 31st March, 1959. (See this issue.)

New Zealand.—G.P.O., Wellington. 15th January. Connectors and pilot lamps. (E.S.B. 28894/57. Ten/29564.)* 21st January. Switches and radio instrument dials. (E.S.B. 28892/57. Ten/29563.)* 29th January. Switches and fuse holders. (E.S.B. 28893/57. Ten/29583.)* 31st January. Adhesive insulating tape. (E.S.B. 29181/57. Ten/29636.)*

State Hydro-Electric Department, Wellington. 18th February. Twenty-one 220 kV circuit-breakers. (E.S.B. 29207/57. Ten/29657.)* 4th March. Four 6,667 kVA transformer units. (E.S.B. 29208/57. Ten/29658.)* 11th March. Twelve or thirteen 14,800 kVA transformer units. (E.S.B. 28868/57. Ten/29574.)*

Wellington Electricity Department. 21st January. H.v. and l.v. joints and boxes. (E.S.B. 29182/57. Ten/29635.)*

Pakistan—Posts and Telegraphs Department, Karachi. 21st December. Porcelain insulators. (E.S.B. 28928/57. Ten/29562.)*

Portuguese East Africa.—Ports, Railways and Transport Department, Lourenço Marques. 17th January. Electrical equipment for the illumination of a railway marshalling yard. (E.S.B. 28794/57. Ten/29570.)* Electrical equipment for lighting of railway warehouses. (E.S.B. 28793/57. Ten/29569.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 19th December. L.v. industrial type switchboards. (E.S.B. 29119/57. Ten/29625.)* 20th December. 4,520 torch batteries and year's supply of cycle lamp batteries. (E.S.B. 29115/57. Ten/29623.)*

South Africa.—Union Tender and Supplies Board. 19th December. Electric salt bath furnace. (E.S.B. 28813/57. Ten/29554.)* 9th January. Air-depolarised cells. (E.S.B. 28808/57. Ten/29553.)*

Stores Department, South African Railways, Johannesburg. 18th December. Electric cable. (E.S.B. 28732/57. Ten/29520.)* 8th January. One 500 kVA transformer and one 6·6 kV oil circuit-breaker. (E.S.B. 29091/57. Ten/29608.)* 10th January. Electric cable. (E.S.B. 29095/57. Ten/29617.)*

Wanstead and Woodford.—Borough Council. 3rd January. Supply of electric lamps for one year (Form No. 12). Borough engineer and surveyor, Municipal Offices, Woodford, E.18.

York.—York and Tadcaster Hospital Management Committee. Firms wishing to be included in the prescribed list for maintenance contracts are asked to submit their names. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Glasgow.—Municipal Transport Committee. Trolley wire (£11,378). — British Insulated Callender's Cables.

London.—L.C.C. Electrical installations in blocks Nos. 1, 2, 3 and 4, Morningside estate, Hackney (£2,807).—Evans & Shea, Ltd. Fifty electric passenger lifts at various housing estates (£114,298).—Express Lift Co., Ltd.

Oban.—Corporation. Recommended, subject to Ministry of Transport approval. Improvement of trunk road lighting (£5,180). —G.E.C.

Newcastle-on-Tyne. — Education Committee. Electric lighting and power installations at new secondary schools at Kenton, Newcastle (£13,851).—A. S. Lowrey & Son.

Reading.—Corporation. Electrical installations in 89 houses on the Whitley estate (£1,488).—Hammants (Henley), Ltd. Installations in 207 houses on the same estate (£3,820).—Southern Electricity Board.

Southport.—Lighting Committee. Recommended. Thirty-four "S.O. Fifty" and 454 "S.S. Fifty-one" lanterns and equipment for street lighting conversion schemes.—A.E.I. Lamp & Lighting Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Blackburn.—Extensions to Central Library (£100,000) and erection of branch library at Shadsworth (£15,000); town clerk, Town Hall.

Blyth.—Houses (35), Patterdale Road; D. W. Foster, borough engineer.

Bolton.—Newspaper offices and printing works, Victoria Square, etc., site; Tillotsons Newspapers, Ltd., Mealhouse Lane, Bolton.

Bradford.—Additions and alterations to Linton Special School (three-year project); W. Clifford Brown, city architect.

Chester.—Extensions to City High School; Saxon Smith & Partners, architects, 2, Stanley Street.

Coventry.—Administrative block and classrooms, Whitley Abbey School; A. Douglas-Jones, architect, Margaret Street, Birmingham, 3.

Dwellings (71), Sewell Highway; K. B. Benfield & Co., Ltd., 10, Old Church Road, Bell Green.

Doncaster.—Wilby Carr Secondary Modern Mixed School, Cantley (£150,000); borough architect, 15, South Parade.

Douglas (Isle of Man).—Central omnibus station, Lord Street site; borough engineer, Town Hall, Douglas, I.O.M.

Durham.—Secondary modern school at Medomsley; W. & T. R. Milburn, architects, 18, Fawcett Street, Sunderland.

Secondary modern school, Leam Lane, Felling; C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.

Eastbourne.—Flats (48), Ocklynge Farm estate; Wm. Ellis, Ltd., builders, High Street, Etchingham.

Fleetwood.—Houses (77), West View estate; Chadwick & Ward, architects to T.C., Dickson Street, Blackpool.

Gosforth (Northumberland).—Development of land in Wansbeck Road, including shops, public house, garage, church, and houses; M. J. Liddell & Sons, builders, 36, Great North Road, Newcastle-on-Tyne.

Harold Wood.—Operating theatre suite, General Hospital; A. E. Symes, Ltd., builders, Ongar Road, Brentwood.

Hendon.—St. Mary's C.E. Secondary School, Downage; Woodroffe, Buchanan & Coulter, architects, 5, Bedford Row, London, W.C.1.

Hornsey.—Erection of school on the Muswell Hill Station site; borough engineer, Town Hall, Hornsey, N.8.

Houghton-le-Spring.—Parade of shops at Shiney Row for Thompson's Red Stamp Stores; Tarren & Caller, architects, 16, Great North Road, Newcastle-on-Tyne.

Hull.—Offices and showrooms, Brook Street; Gelder & Kitchen, architects, 120, Alfred Gelder Street.

Works and offices; Jackson Mills, Ltd., Gillett Street.

Inverness.—Further technical education centre, Longman estate (£192,000); county architect, County Offices, Inverness.

Jarrow-on-Tyne.—Factory extension on the Bede estate for Morganite Resistors, Ltd.; Turley & Williamson, architects, 46, Jesmond Road, Newcastle-on-Tyne.

Kerrier.—Houses (60), St. Keverne; W. Thomas, clerk to R.D.C., The Willows, Helston, Cornwall.

Kettering.—New buildings for General Hospital; Gollins, Melvin, Ward & Partners,

architects, 15, Manchester Square, London, W.1.

London.—Rebuilding St. Michael's Church, College Hill, City; Devereux & Davies, architects, 3, Gower Street, W.C.1.

Works extensions, Greenwich; Delta Metal Co., Ltd., Tunnel Avenue, S.E.10.

Offices and flats, Lowndes Street, Westminster; Higgs & Hill, Ltd., builders, Crown Works, South Lambeth Road, S.W.8.

Offices, Brixton Road; J. Brandon-Jones, architect, 2, Redington Road, N.W.3.

Flats (22), Farrance estate, Stepney; A. T. Rowley, Ltd., builders, Cambridge Works, Lordship Lane, N.17.

County secondary school, Stockwell (£440,000); Gee, Walker & Slater, Ltd., builders, 100, Park Lane, W.1.

Lytham St. Annes.—Engineering factory, Preston Road; North Cambrian Holdings, Ltd., 13, Whitefriars, Chester.

Milford Haven.—Works, Lower Priory; Pipe & Wynne-Jones, Ltd., 10, West Bute Street, Cardiff.

Nailsea.—Erection of North West Somerset Grammar School; R. O. Harris, county architect, Park Street, Taunton.

Newcastle-on-Tyne. — Factory, Station Road, Walker; R. N. Dodds & Son, general engineers.

Additional storey at medical school, King's College; Newcombe & Newcombe, architects, 23, Eldon Square.

New Rutherford College of Technology (stage 4) for the E.C.; Leslie & Co., contractors, 80, Woodland Road, Darlington.

New school at Benton Road; G. Kenyon, city architect, 18, Cloth Market.

Proposed Kenton Secondary Modern School (£319,000); Coseley Civil Eng. Co., Ltd., general contractors, Lanesfield, Wolverhampton.

Luxury flats (120), Montagu Avenue; Cussins, Ltd., builders, The Drive, Gosforth.

Newmarket.—Fire station (£20,000); E. J. Symcox, architect to the Suffolk and Ipswich Fire Authority, County Hall, Ipswich.

Newton Aycliffe. — County school (£130,000) and maternity clinic (£16,600); county architect, Durham.

Northampton.—Workshop block, Central College of Further Education; H. A. Skerrett, chief education officer, Springfield, Cliftonville, Northampton.

Northfleet.—Extensions to Council offices, Council Avenue; U.D.C. surveyor, Council Offices, Northfleet, Kent.

North Riding.—Additions to Guisborough Grammar School; J. Breakwell, architect, 10, Hill Street, St. Helier, Jersey, Channel Islands.

North Shields.—Large factory additions for Formica, Ltd.; John Laing & Sons, contractors, Dalston Road, Carlisle.

Northumberland.—Fire station at Haydon Bridge; county architect, County Hall, Newcastle-on-Tyne.

Old Hill.—Factory and offices, Lloyds Road; J. Parkes & Co. (Old Hill), Ltd., Beadmore Road.

Oxford.—Slipper baths, East Oxford; city architect.

Works and stores, Abingdon Road; W. P. Spearman, Ltd., 18, Elms Road, Cassington, Eynsham.

Plymouth.—Works extensions; Tecalemit, Ltd., Forder Valley Road, Marsh Mills.

Redbourne. — Warehouse and packing station; Brooke, Bond & Co., Ltd., Goulston Street, London, E.1.

Rochdale.—St. Joseph's R.C. Secondary School (£145,550); Kenyon Construction Co., Ltd., 9, Lime Bank Street, Ardwick, Manchester, 12.

Sheffield.—Proposal for completion of the new teaching hospital (£500,000), twin operating theatre suite at Jessop Hospital (£62,000) and out-patients' department at the Children's Hospital (£105,000); Board of Governors, Central Office, West Street, 1.

Factory, Matilda Street, for Slack & Barlow (Sheffield), Ltd., manufacturing cutlers, Sycamore Street, 1; Oxley & Bussey, architects, 91, Pinstone Street, Sheffield, 1.

St. Helens.—Large office block; Fry, Drew, Drake & Lasdun, architects, 63, Gloucester Place, London, W.1.

Smethwick.—Ambulance station; borough engineer.

Solihull.—Out-patients' department and staff accommodation at Solihull Hospital; Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

South Shields.—Three-storey block of flats (243 dwellings), St. Mark's housing site; J. Reid, borough engineer.

Stockport.—New science block at Belmont Secondary School, and further stage of science block and library at Avondale Secondary School; J. Rank, borough architect.

Stockton-on-Tees.—Bungalows (34), adjoining Dumbarton Avenue; borough architect, 28, The Square.

Thornton Heath.—Factory; G. G. Engineering, Ltd., 14, Northwood Road.

Warrington.—Works extensions; Laporte Chemicals, Ltd., Baronet Road.

West Bromwich.—Laboratory extensions; Robinson Bros., Ltd., Phoenix Street.

West Hartlepool.—Proposed St. Teresa's School; R. Burke, architect, 10, Lambton Road, Newcastle-on-Tyne.

Whitby.—Houses (33) and two shops at Boulby Bank for the U.D.C.; Peacock & Bewlay, architects, 224, Hagley Road, Edgbaston, Birmingham.

Wolverhampton.—Block of laboratories and classrooms adjacent to Highfields Secondary School; borough engineer, Town Hall.

Fire station, Bushbury Road; borough engineer.

Worcester.—Permanent buildings for the City of Worcester Teachers' Training College; H. Hobbiss & Partners, architects, 36, Waterloo Street, Birmingham.

Grammar school for girls; director of education, 4, Copenhagen Street.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 16th December

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

IPSWICH.—Electric House, 7.15 p.m. Ipswich and District Electrical Association. Film show.

LIVERPOOL.—Liverpool Passenger Transport Office, 24, Hatton Garden, 6 p.m. I.E.S. Liverpool Centre. "Lighting and Coal Mining," by W. E. Mangnall.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. Informal evening on "Electronics and Automation—Electronics in the Textile Industry," talk by K. J. Butler.

STAFFORD.—Crispin Hotel, Stone Road. I.E.E. North Staffs. Graduate and Student Section. Informal meeting.

Tuesday, 17th December

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Ship Stabilisation: Automatic Controls, Computed and in Practice," by J. Bell.

GLASGOW.—39, Elmbank Crescent, 6.30 p.m. Institution of Engineers and Shipbuilders in Scotland. "The Electrification of Factories," by J. McCulloch.

HUDDERSFIELD. — Y.E.B. Offices, Market Street, 7 p.m. I.E.E. North Midland Graduate and Student Section. Sheffield Exchange Paper, "Some Aspects of Grid Controlled Mercury Arc Rectifiers," by J. Bennett.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Informal lecture on "Recent Uses of Ultrasonics in Investigating the Characteristics of Materials," by Dr. J. Lamb.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. Fourth Graham Clark Lecture on "The Engineer and Management," by Sir Ewart Smith. (Joint meeting with the I.E.E. and I.Mech.E.)

Wednesday, 18th December

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. Lecture on "The Planning and Construction of Large Modern Thermal Generating Stations," by J. Pimpaneau. (Joint meeting with the British Section of the Société des Ingénieurs Civils de France.)

Conference Room, 4th Floor, Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. Informal meeting. "Plant, Personnel and Service—Area Approach to Maintenance," by W. H. Owens.

At the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "Recent Developments in Electronic Instrument Design," by E. Garthwaite and A. G. Wray.

John Adam Street, Adelphi, W.C.2, 2.30 p.m. Royal Society of Arts. "Sir George Cayley (1773-1857): A Pioneer of Science and Engineering," by Captain J. L. Pritchard.

NOTTINGHAM. — E.M.E.B. Showroom Theatre, Smithy Row, Nottingham, 7.30 p.m. A.S.E.E. Nottingham Branch. "The Approved Contractor and the National Inspection Council," by E. J. Sutton.

ROCHESTER. — King's Head Hotel, High Street, 7 p.m. Incorporated Plant Engineers, Kent Branch. "An Application of Incentives to Boiler House Operations," by K. Bentley.

SKEGNESS. — Y.M.C.A. Holiday Centre, Woodside, Grosvenor Road, 7.15 p.m. Ministry of Works, Skegness Branch. "Small Heating and Ventilating Installations," by E. W. Herrington.

Thursday, 19th December

BLACKBURN.—Golden Lion Hotel, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "Some Aspects of Boiler Inspection," by W. A. Mills.

CHELMSFORD. — Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Marine Electrical Installations," by A. N. Savage.

LONDON. — At the I.E.E., Savoy Place, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Electrical Floor Warming," by W. F. Parker.

Caxton Hall, Westminster, S.W.1, 2.30 p.m. Diesel Engineers' and Users' Association. "Report on Heavy Oil Engine Working Costs and Performance 1956/57," and an informal discussion on "Operating Problems."

MAIDSTONE.—Wig & Gown Hotel. A.S.E.E. Kent Branch. Ladies' evening.

MANCHESTER. — N.W. Electricity Board, Town Hall, 6 p.m. I.E.S. Manchester Centre. "Lighting for Photography," by R. W. Unwin.

Friday, 20th December

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Branch. "New Light Sources," by F. Jackson.

GLASGOW.—39, Elmbank Crescent, 6.45 p.m. West of Scotland Iron and Steel Institute. "Electric Melting Furnaces," by F. S. Leigh.

HALIFAX.—Crown Hotel. A.S.E.E. Halifax Branch. Annual dinner.

LONDON.—Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. Informal meeting. "The Use of Computers in Industry," by W. V. Barton.

Tudor

are pleased to announce that they have

been awarded contracts for supplying

batteries and associated equipment for

HUNTERSTON

(Sub-Contract from the General Electric Co. Ltd.)

BRADWELL

(Sub-Contracts from The Nuclear Power Plant Co. Ltd., and A. Reyrolle & Co. Ltd.)

Tudor have also supplied batteries and associated equipment to the following nuclear power stations:

CALDER HALL 'A'
CALDER HALL 'B'
CHAPEL CROSS
DOUNREAY

(Supplied under sub-contracts from:
A. Reyrolle & Co. Ltd.
The English Electric Co. Ltd.
Brush Electrical Engineering Co. Ltd.)

Tudor

Specialists in battery work for nuclear power stations

THE TUDOR ACCUMULATOR COMPANY LTD., 137 VICTORIA STREET, LONDON SW1 TEL: TATe Gallery 0307

WORKS: DUKINFIELD, CHESHIRE TEL: ASHTON-UNDER-LYNE 1651

T.170

CAPACITANCE/INDUCTANCE MEASURING BRIDGE

designed for locating faults on power distribution networks

Comprising —

- POWER UNIT
- OSCILLATOR
- DETECTOR AMPLIFIER
- IMPEDANCE BRIDGE

GAMBRELL BROS. & CO. LTD.

105/107 Lansdowne Road, Croydon, Surrey

Telephone : CROYDON 8282

A. PEARCE (B'ham.) LTD.

Makers of

"APCO" range of automatic and non-automatic KETTLE IMMERSION ELEMENTS

ON ADMIRALTY LIST

Specialists in the

INSULATION OF BARS AND TUBES IN MICANITE AND BAKELITE

A. PEARCE (B'ham.) LTD.

EST. 1899

MORCOM ROAD WORKS, GREET
BIRMINGHAM 11
Phone: Acocks Green 0102

FAP
CONDUIT FITTINGS AND ACCESSORIES
For quality & service
FLEXIBLE METALLIC TUBING AND ADAPTORS
FITTER & POULTON ltd.
TELEPHONE CALTHORPE 1151-2 · TELEGRAMS FAP BIRMINGHAM
VINCENT PARADE · BIRMINGHAM · 12

SM/FP 2959

275-kV TRANSFORMERS BY BTH

1951

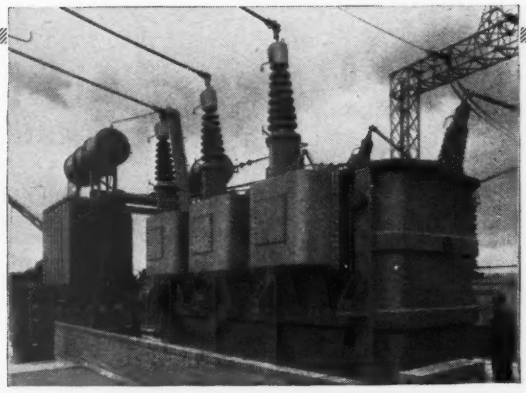
120 MVA UNDER CONSTRUCTION

BTH were first to be awarded a contract for the supply of 120-MVA 275/132-kV transformers for the C.E.A. Super Grid.

1953

120 MVA IN SERVICE

The first 120-MVA unit was commissioned in July 1953. Up to date, ten of these units have been installed or are on order.



120-MVA 275/132-kV transformers at the Staythorpe Sub Station of the C.E.A.

Another step forward

1957

180-MVA ORDER PLACED ON FACTORY

C.E.A. has now placed with BTH one of the first two orders for 180-MVA 275/132-kV transformers

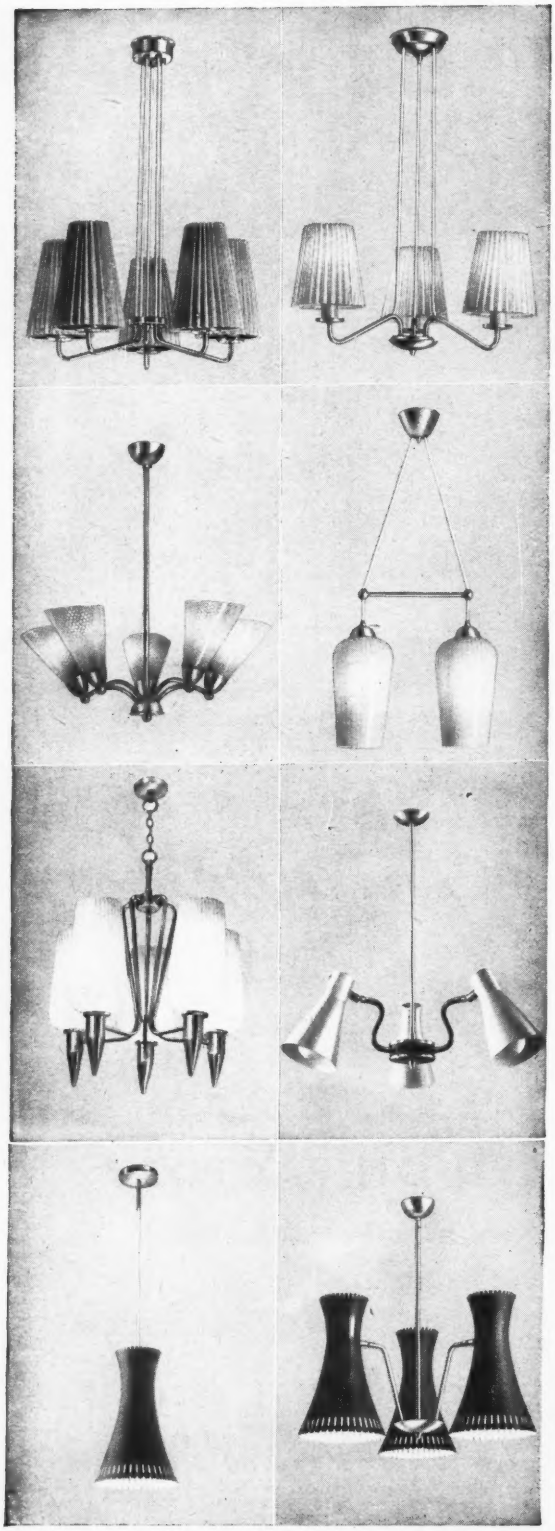
B T-H **BRITISH THOMSON-HOUSTON**

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

Member of the AEI group of companies

A5202

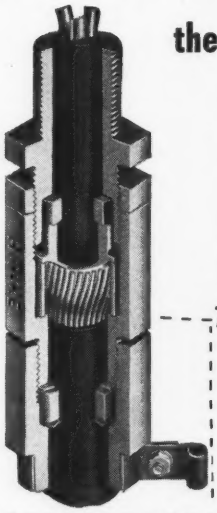
New Catalogue of Contemporary Lighting Fittings



Write for your copy of Publication 166ER

C. M. CHURCHOUSE LTD., Clarendon Cross, London, W.11

SINCE ONLY THE BEST IS GOOD ENOUGH...



the 'HAWKE' range of cable glands now include a patent earth clip ensuring perfect safety

The new

Hawke

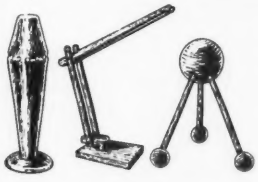
a masterpiece in GLAND design

Write for further details to

HAWKE CABLE GLANDS LTD

ASHWORTH ST., DENTON, LANCS. Tel.: DENTON 3868

if it's made in we make it WOOD



WOODEN PARTS FOR CONTEMPORARY LAMPS *of every description*

The Leading Specialists in Mass Produced Woodware

THE LUNDEGARD HARDWOOD CO. LTD.

161 Borough High Street
London, S.E.1
Telephone: HOP 4844

HOUSE SERVICE METERS

Credit Pattern and Prepayment Type

200-240 v. A.C. S/Ph 50 c. (& D.C.)

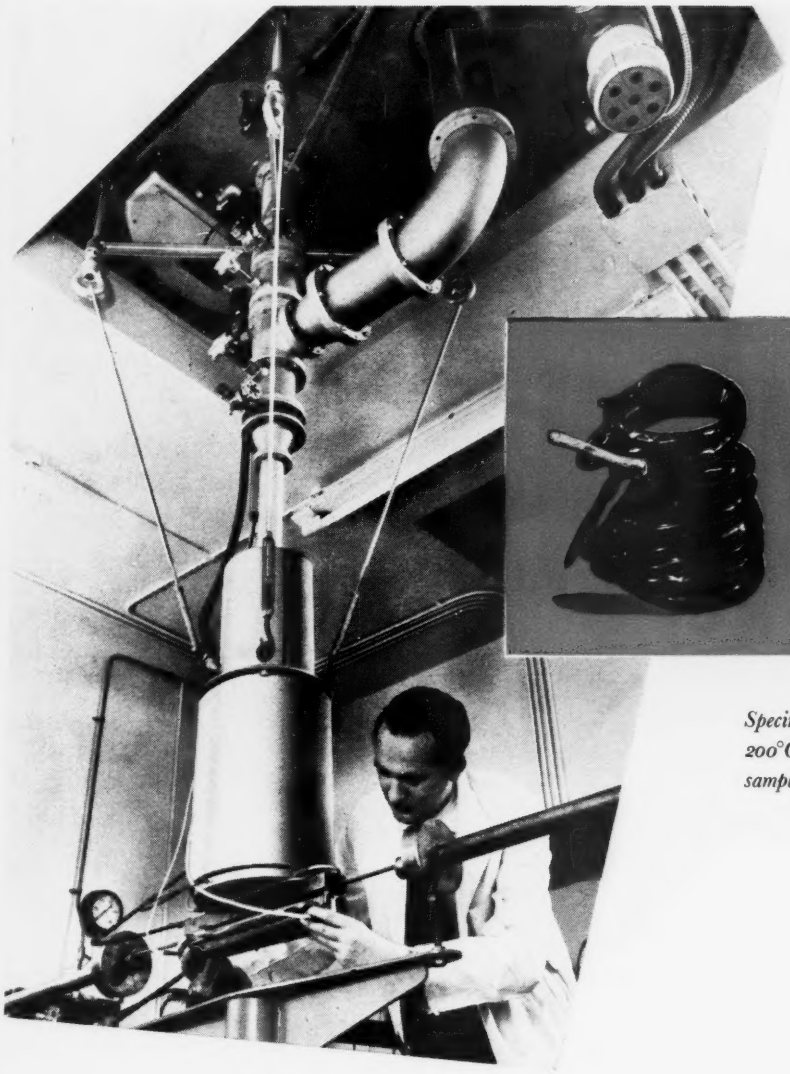
AVAILABLE FROM STOCK

POLYPHASE 400-440 v. 3-Wire Type

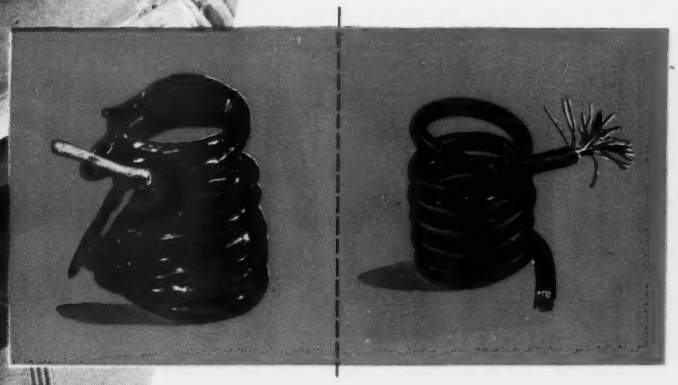
Ex Stock

UNIVERSAL ELECTRICAL CO.

217-221 City Road, London, E.C.1



Setting up polythene core ready for irradiation.



Specimens of polythene cable after heating at 200°C. Left: Normal sample. Right: Irradiated sample.

How we make good cables—better

Take polythene for instance, already noted for its excellent electrical characteristics and widely used in the cable industry.

Then make it stronger, more elastic and improve its temperature characteristics. The result, a better material still.

How do we do it? By bombarding polythene with electrons to cause a chemical change. A process known as electron irradiation and an important step forward in the general development of plastic materials for our wide range of cables.

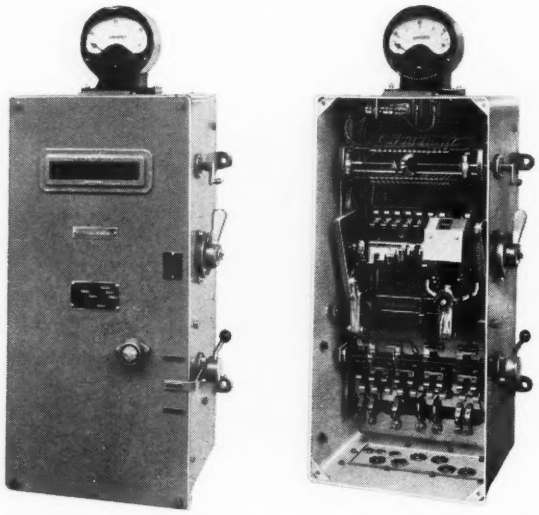
We have a publication which tells you more about this process. May we send you a copy?

BICC IRRADIATION OF POLYTHENE

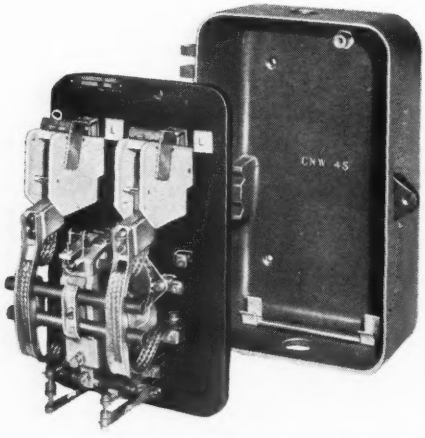
BRITISH INSULATED CALLENDER'S CABLES LIMITED · 21 BLOOMSBURY STREET · LONDON, W.C.1

G

Control Gear for Marine Service . . .



Hand operated drum breaker starter type DDA 12½ to 25 h.p. 200/250 V. D.C. Totally enclosed for bulkhead mounting between decks. Complete with illuminated ammeter, pilot light with fuses, shunt field regulator, and isolator/reverser interlocked with enclosure cover.



Contactor type CNW/DC Double Pole Rating 50 amp. D.C. Fitted with anti-roll latch and silver faced contacts for heating loads.

TO BS 587/57 AND LLOYDS OR SIMILAR REQUIREMENTS

Our marine range covers:

MOTOR CONTROL GEAR

D.C. Hand operated starters.
Automatic step starters.

A.C. Direct-on-line starters.
Automatic Star Delta Starters.
Stator Rotor Starters.

CONTACTORS AND RELAYS

A.C. or D.C. up to 300 amps.

RHEOSTATS

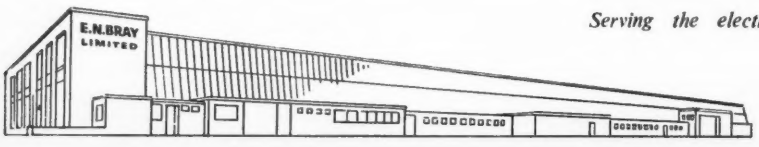
FACE PLATE TYPE CONTACT RHEOSTATS HAND OR MOTOR OPERATED.

ALSO AVAILABLE IS A SIMILAR RANGE OF EQUIPMENT TO ADMIRALTY REQUIREMENTS.

E. N. BRAY LIMITED

Control Gear Works, Britannia Road, Waltham Cross, Herts. Telephone: Waltham Cross 2212/3/4/5

Serving the electrical industry for more than 30 *years*



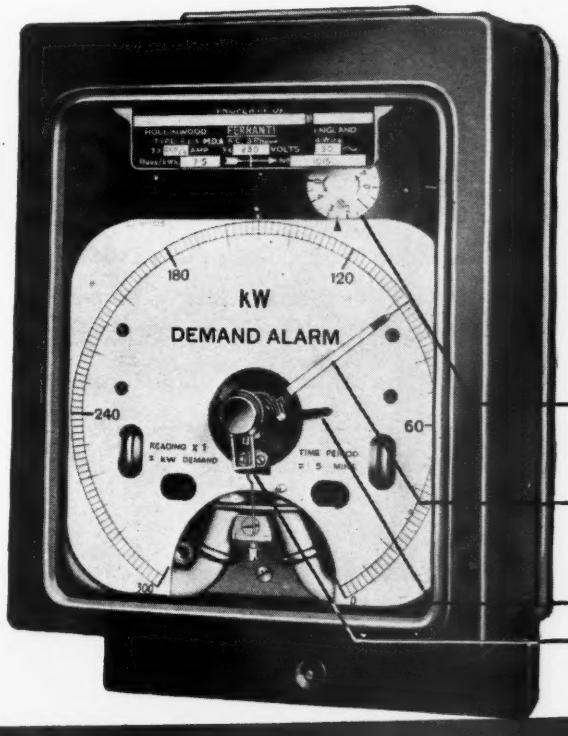
KEEP YOUR ELECTRICITY COSTS DOWN

by ensuring that you do not exceed your predetermined maximum demand

instal a **FERRANTI**

3 PHASE MAXIMUM DEMAND ALARM

- Advance warning of approaching maximum demand—steps can then be taken to reduce load.
- Load reviewed every five minutes.
- Large clear dial for easy setting of maximum demand pointer.
- Load pointer and time dial clearly visible.
- Substantial contacts for operating separate warning device.



FERRANTI

- Time dial (5 min. resetting)
- Maximum demand pointer
- Load pointer
- Sealing device

FERRANTI LTD · MOSTON · MANCHESTER 10 London Office: 36 KINGSWAY W.C.2

FI 165/2

M and I Silicone Glass Laminates are available in these grades

S9 SILICONE GLASS PAXOLIN complying with DEF-5000 type S.1.

S5 SILICONE GLASS PAXOLIN having superior machining characteristics. This grade complies with DEF-5000 type S.1. except for impact strength.

M & I are specialists in silicone electrical insulation for Class "H" applications.

We supply:—

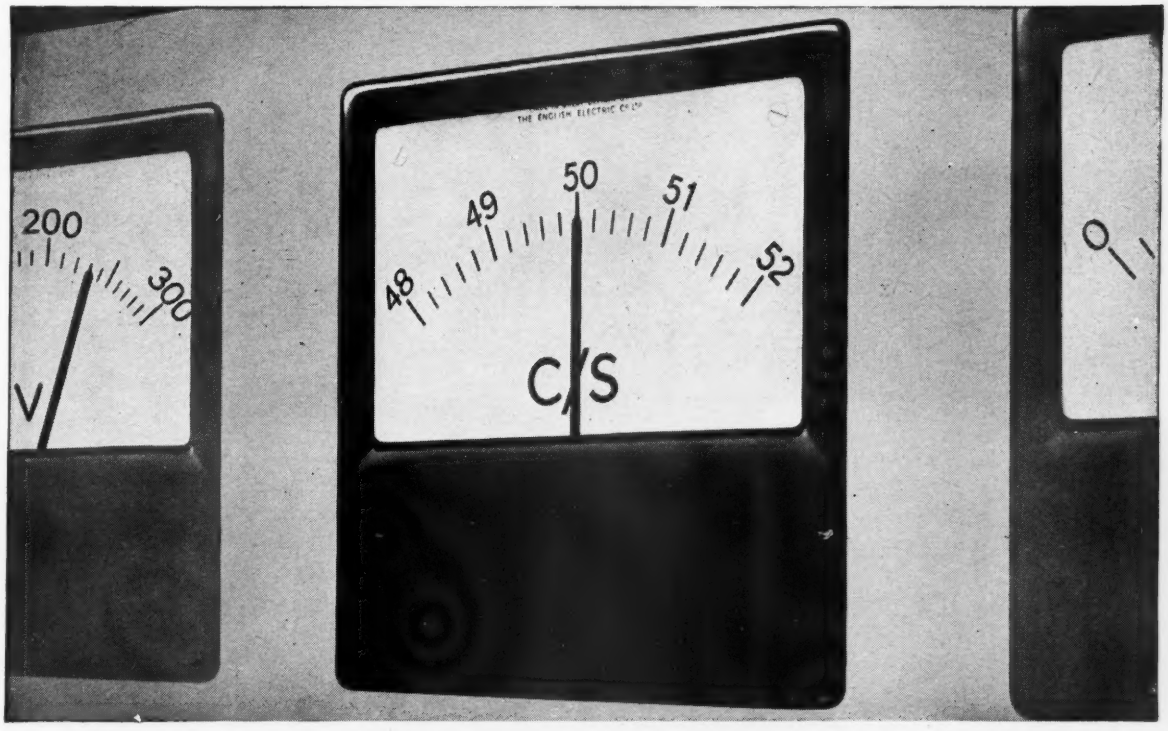
Silicone Empire varnished glass.
Silicone elastomer coated glass fabric tapes.
Silicone bonded mica tape.
Silicone bonded mica glass sheets.
Silicone bonded flexible Micanite.
Silicone bonded hard Micanite.
Silicone commutator insulation.
Silicone combination insulation.
Silicone glass sleeving.

Enquiries are invited.

m and i **the electrical insulation people**

THE MICANITE & INSULATORS CO., LTD.,
Blackhorse Lane, Walthamstow, London, E.17. Tel: Larkswood 5500.
Grams: "Mytilite", Easphone, London.
"Paxolin" is a registered trade name of The Micanite & Insulators Co., Ltd.

Not disturbed by normal voltage fluctuations



THE NEW 'ENGLISH ELECTRIC' FREQUENCY INDICATOR has been developed especially to maintain a stable and accurate reading even at times of normal voltage fluctuations and despite the presence of harmonics in the supply voltage waveform. The extraordinary accuracy of these instruments ensures negligible error at nominal supply voltage and an average error of less than .03% at the nominal supply voltage ±10%

'ENGLISH ELECTRIC'

indicating instruments

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

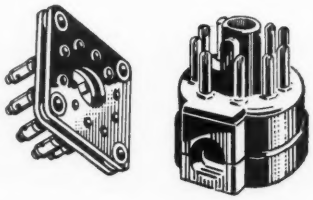
Meter, Relay and Instrument Division, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

INS 37H7

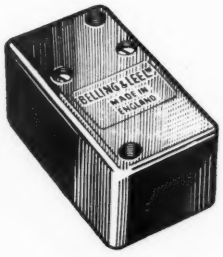
IF YOU NEED TO

CONNECT

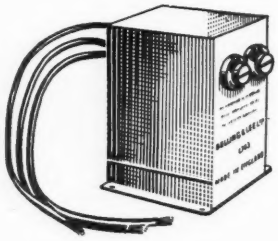


PROTECT

CONTROL



FILTER

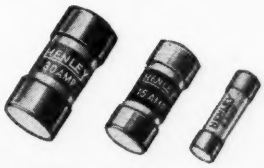


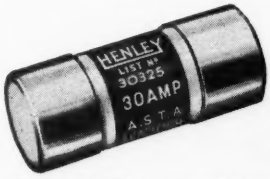
. . . there are "Belling-Lee" components tailored to your requirements by over 35 years of "know-how"

Full details of our range of components are available in the "Belling-Lee" General Catalogue. If there is not a copy in your establishment please write to us.

BELLING & LEE LTD
GREAT CAMBRIDGE ROAD, ENFIELD, MIDDX., ENGLAND
Telephone: Enfield 3322 · Telegrams: Radiobel, Enfield

ELECTRONIC COMPONENTS





CARTRIDGE FUSE-LINKS

Domestic Type Complying with B.S.1361: 1947 5, 15 and 30 amp. Category of Duty 250 AC3 A.S.T.A. Certified

Service Type up to 60 amp. Complying with B.S.88: 1952 A.S.T.A. Certified

Service 250
Category of duty 250 AC4

Service 440
Category of duty 440 AC4

Send for Folder 30/A

SLOW-BREAK SWITCHES

Of robust design with non-track mouldings and suitable for up to 500 volts A.C. only.

30 ampere, double-pole, back or front entry
60 ampere, double-pole, front entry
60 ampere, triple-pole, front entry
60 ampere, triple-pole, back entry

Send for Folder 45/N

HENLEY

ELECTRICAL
DISTRIBUTION EQUIPMENT

Watch this series of advertisements for many of the interesting items in our wide range of products. We shall be pleased to send you full information.

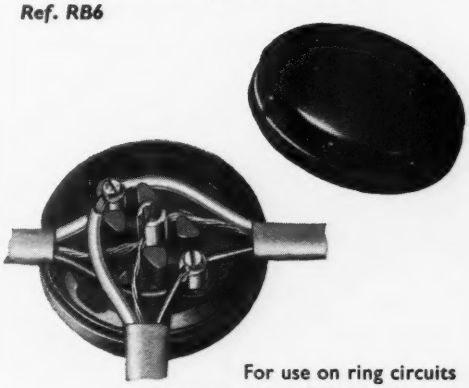
COLD FILLING COMPOUND

For filling cable boxes for paper or rubber insulated cables for working pressures up to 11kV. Consists of black compound and hardening agent (supplied in separate tins) No heating—invaluable for use in collieries, oil refineries, petrol stations, etc.,

Send for Folder 57/D

INSULATED JOINT BOX

Ref. RB6

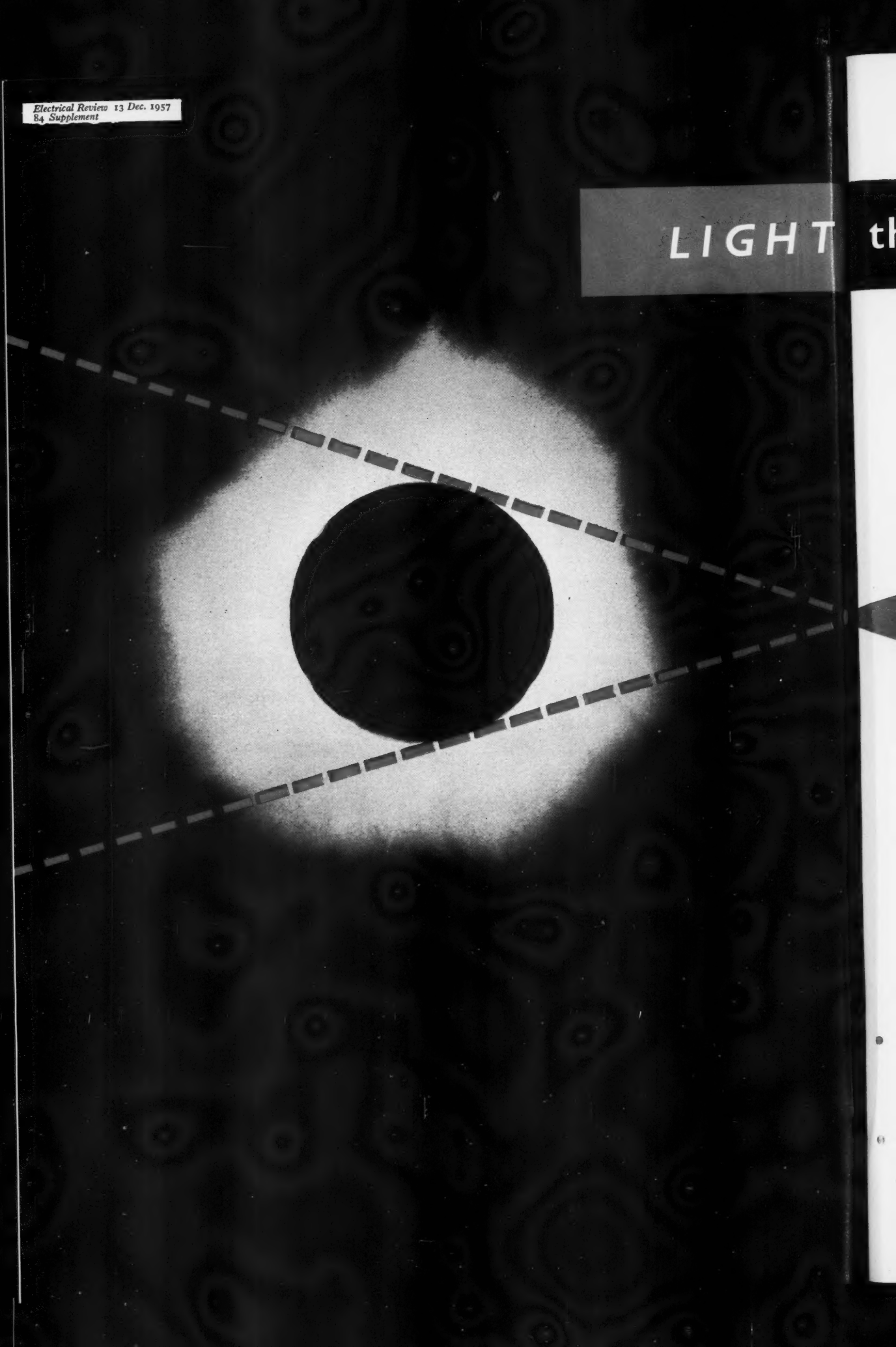


For use on ring circuits
As required by I.E.E. Regulations, 13th Edition, 1955, Clause 114(B) (ii)
For conductors up to 7/·036"

Send for Leaflet WSA/3

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1 *Tel: CHAncery 6822*

Electrical Review 13 Dec. 1957
84 Supplement

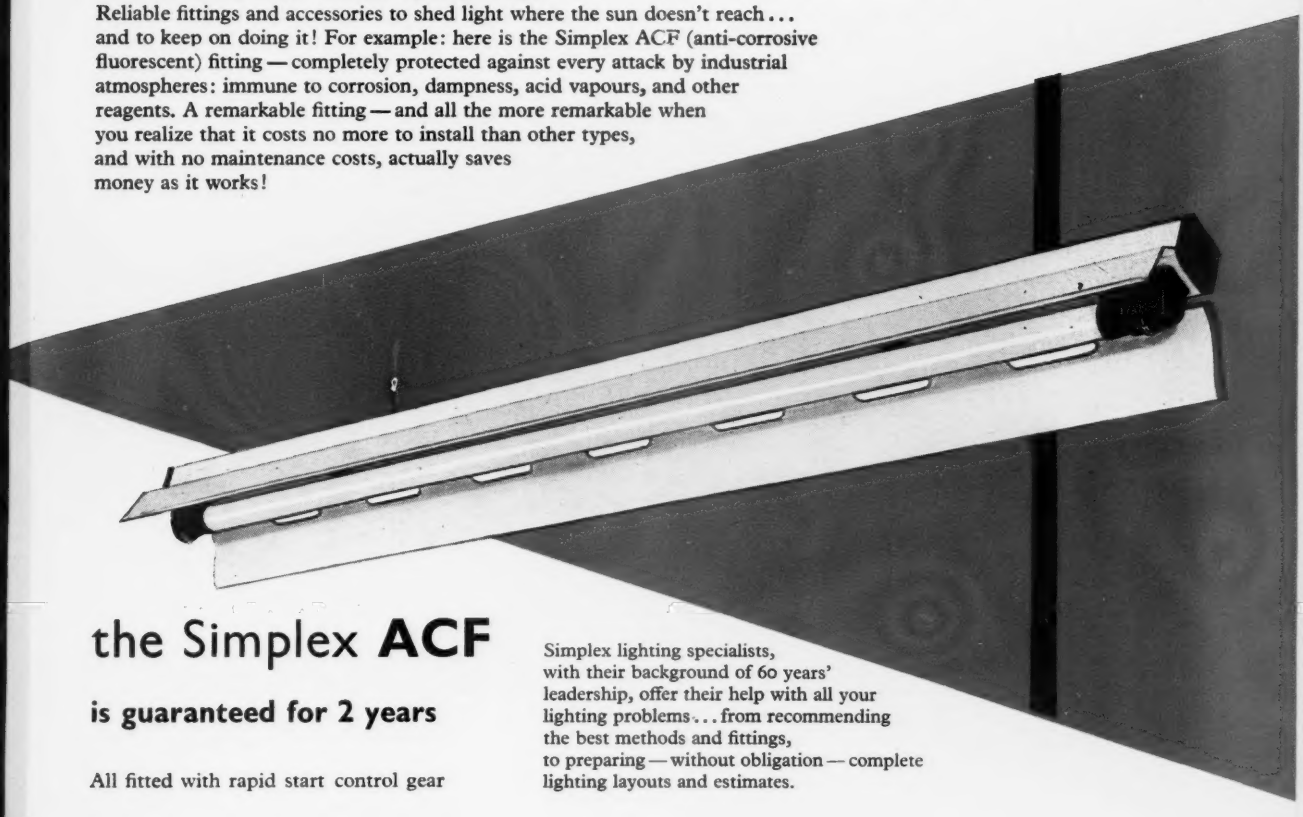


SOLAR CORONA
Solar observations come within the scope of the work of scientists of more than 50 nations throughout the International Geophysical Year. Photograph by courtesy of the Hamburg Observatory

T that won't fail . . .

One side of the picture—
the sun: hub of the solar system. A light that always burns

And the other side? Simplex lighting fittings
Reliable fittings and accessories to shed light where the sun doesn't reach . . . and to keep on doing it! For example: here is the Simplex ACF (anti-corrosive fluorescent) fitting — completely protected against every attack by industrial atmospheres: immune to corrosion, dampness, acid vapours, and other reagents. A remarkable fitting — and all the more remarkable when you realize that it costs no more to install than other types, and with no maintenance costs, actually saves money as it works!



the Simplex **ACF**

is guaranteed for 2 years

All fitted with rapid start control gear

Simplex lighting specialists, with their background of 60 years' leadership, offer their help with all your lighting problems . . . from recommending the best methods and fittings, to preparing — without obligation — complete lighting layouts and estimates.

cut costs and specify

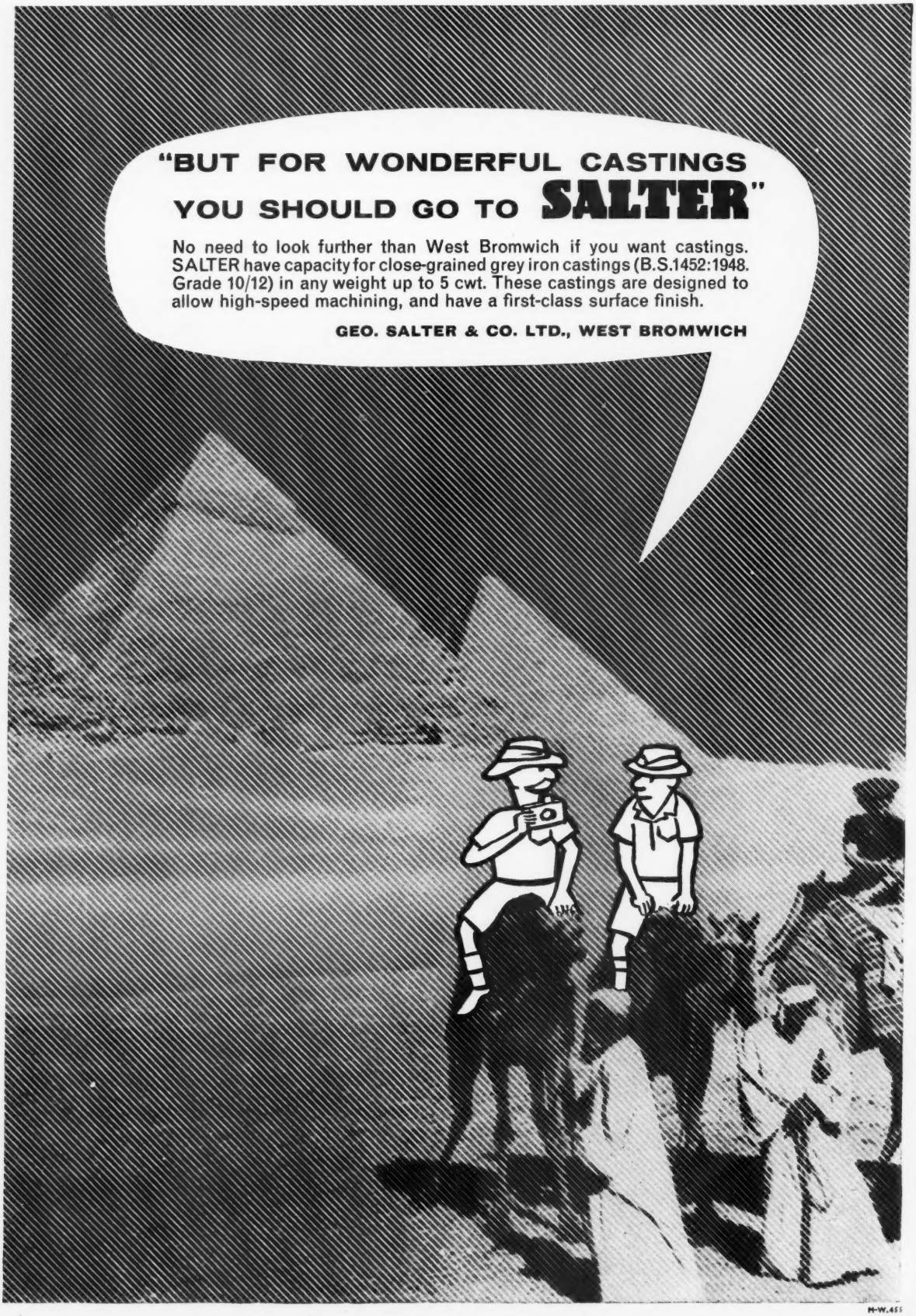
lighting fittings by

Simplex

Simplex Electric Co Ltd Creda Works Blythe Bridge Staffs

Branches throughout Britain and agents throughout the world

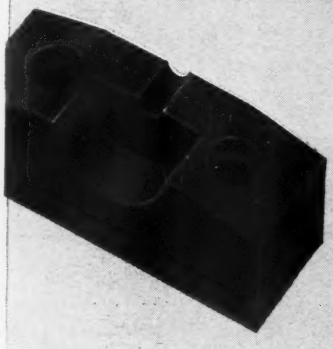
A COMPANY

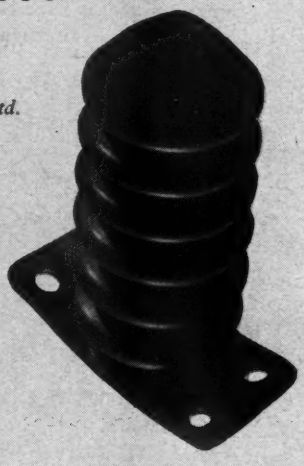

"BUT FOR WONDERFUL CASTINGS
YOU SHOULD GO TO SALTER"
No need to look further than West Bromwich if you want castings. SALTER have capacity for close-grained grey iron castings (B.S.1452:1948. Grade 10/12) in any weight up to 5 cwt. These castings are designed to allow high-speed machining, and have a first-class surface finish.
GEO. SALTER & CO. LTD., WEST BROMWICH
H-W.455

I.C.I. SILICONE RUBBERS

THROUGH THICK AND THIN . . .

Silicone rubber mouldings by The Dunlop Rubber Company Ltd.





I.C.I. Silicone Rubbers can be readily moulded or extruded in thick or thin sections on conventional rubber processing equipment.

GUMS	E. 300, E. 301, E. 350 for compounding
RUBBERS	E. 310 Class for general purposes
	E. 311 and E. 312 for improved strength
	E. 340 Class for low compression set
	E. 370 for cable manufacture
	E. 360 Class for extra low temperature resistance
	E. 380 Class for extra high temperature resistance
PASTES	E. 391 and E. 393 for cloth coating and sealing

Intensive research at the I.C.I. Nobel Division laboratories is constantly providing new knowledge on all aspects of silicones. This information is freely available to intending users—Technical Service experts will be pleased to give advice on any new or existing applications.

I.C.I. SILICONES—*material progress*

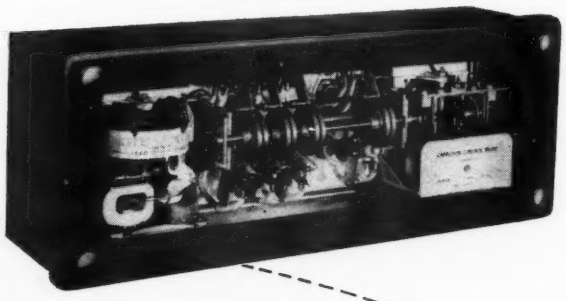
Ask for further particulars from your nearest I.C.I. Sales Office or
IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

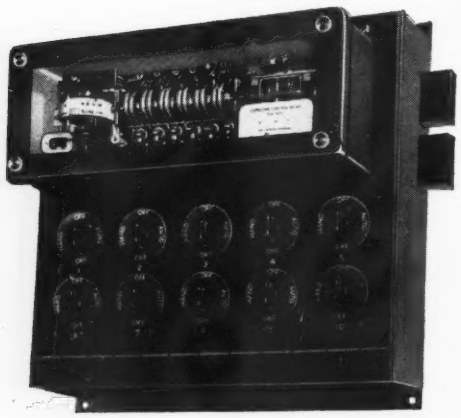
NS. 49

Choose Metrovick relays and correct Power Factor AUTOMATICALLY

Type NJO4 relay for the control of single-step power capacitors.

A complete range of Metrovick relays is available for the control of capacitors as a means of improving the power-factor of industrial loads. Please write for full details.



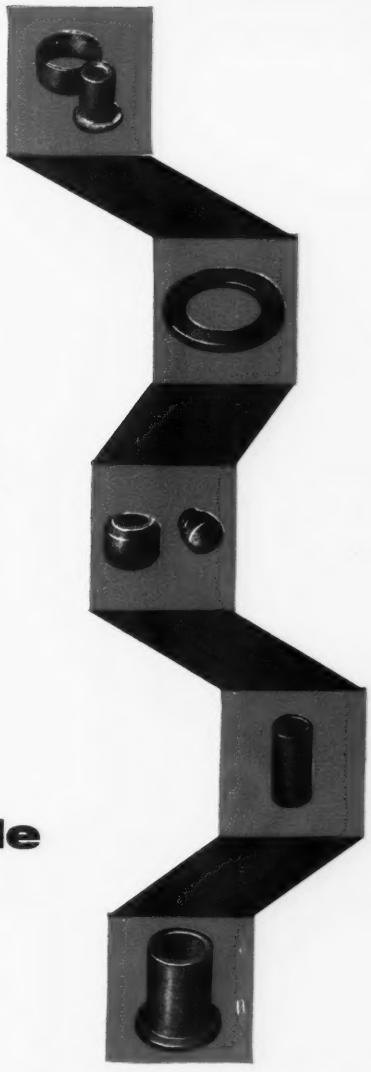


Type NJO3 relay for the control of a number of capacitors or capacitor sections in sequence. It may be switchboard or wall-mounting pattern with or without control switches.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A:E.I. Company

G/A 704



. . . it's standard size but completely inaccessible

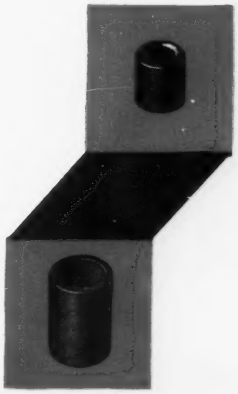
Obviously a case for an oil-retaining bearing — that will cut out lubrication and maintenance.

With these oil-impregnated sintered-metal bearings the oil is fed to the surface by capillary action so that you can get controlled, trouble-free lubrication—automatically.

. . . you should specify *Reservoil*

Sintered Metal ***OIL RETAINING BEARINGS***

There are a variety of shapes and many sizes of "RESERVOIL" bearings for every normal medium duty, but particular attention is drawn to the large range of plain cylindrical bearings to B.S.I. standard dimensions. Most sizes are held in stock.



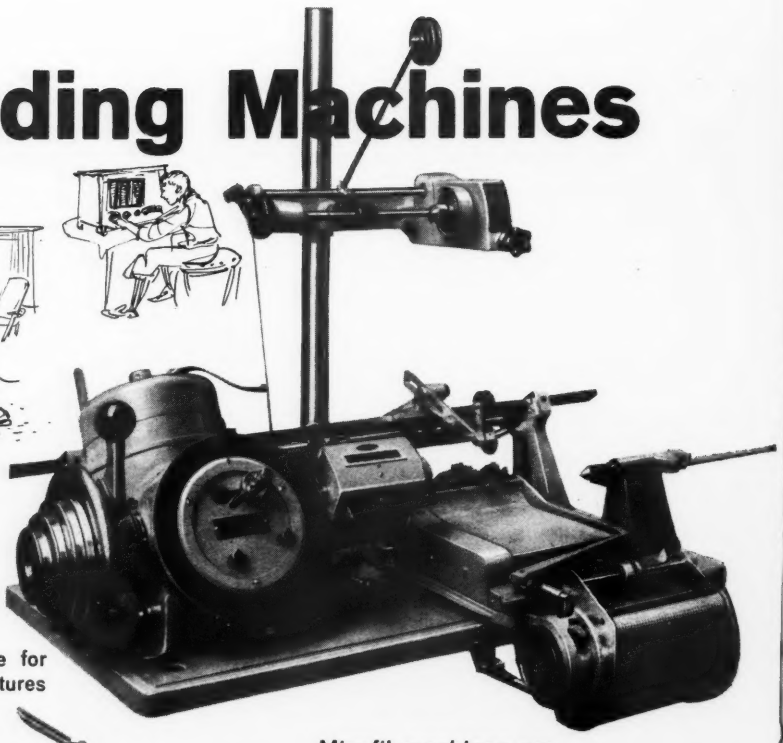
Please write or 'phone for Technical Brochure SD.40 or Catalogue of sizes SD.41

The Morgan Crucible Co. Ltd. Battersea Church Road, London, S.W.11.

Telephone : BAT. 8822

SM.123

Coil Winding Machines



Type OOFA-1/1 PE with fully automatic paper interleaving attachment

Type AWO-A All-automatic machine for mass production of small two-pole armatures

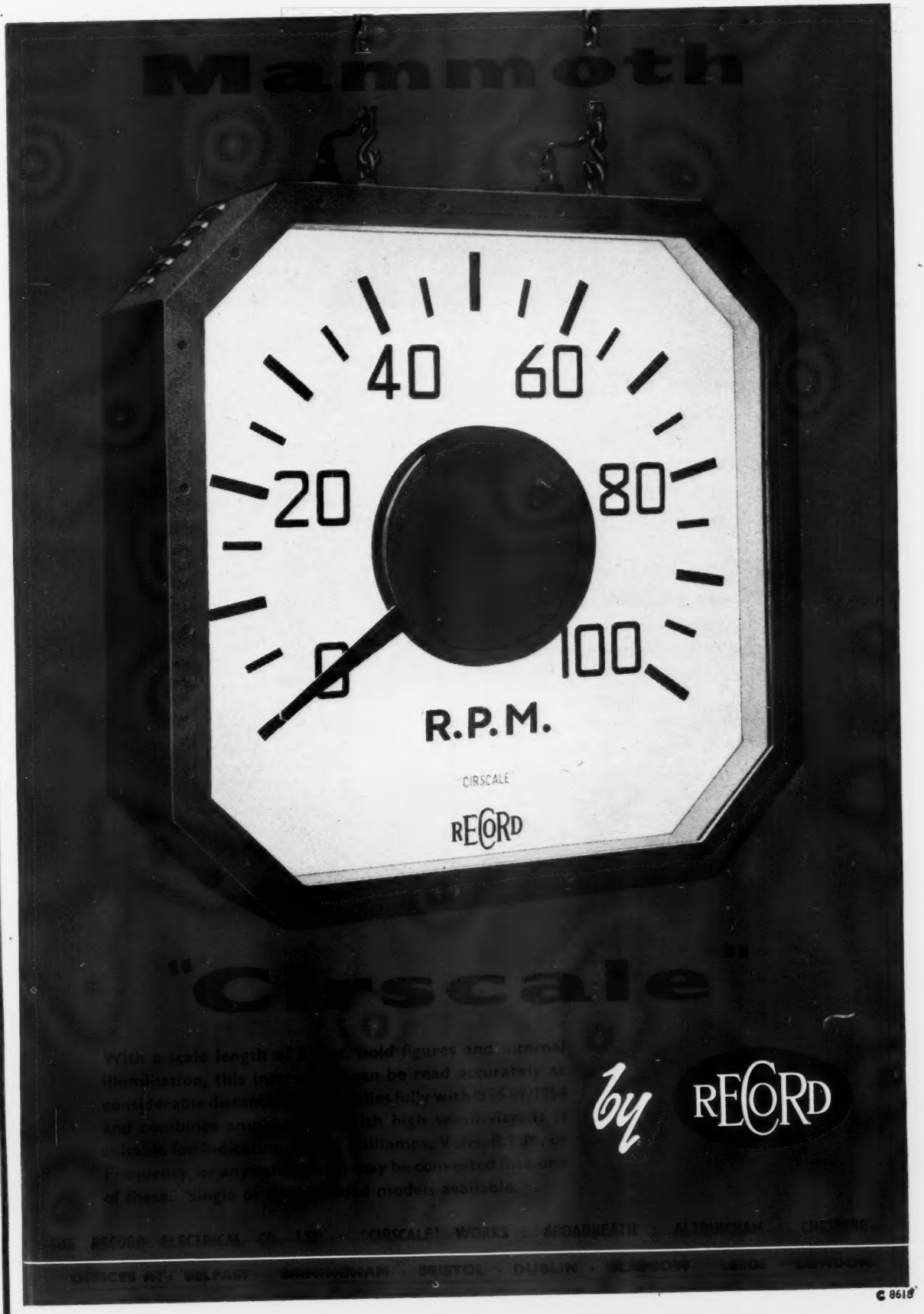
Micafil machines are available for every electrical workshop need. They wind neatly and quickly fine wire and copper strip, flat or on edge. Let our Representative advise you on your winding problems.

IMPAG (London) Ltd.
10, Lloyds Avenue, London E.C.3

MICAFIL LTD.
ZURICH/SWITZERLAND

MICAFIL MD

ELECTRICAL INSULATION CONDENSER BUSHINGS NEPOLIN CAPACITORS
HIGH-VOLTAGE TESTING EQUIPMENT COIL WINDING MACHINES VACUUM PUMPS


Mammoth
40
60
20
80
0
100
R.P.M.
CIRSCALE
RECORD
"Cirscale"
by RECORD
C 8618

A new I.C.I. product to meet a new demand

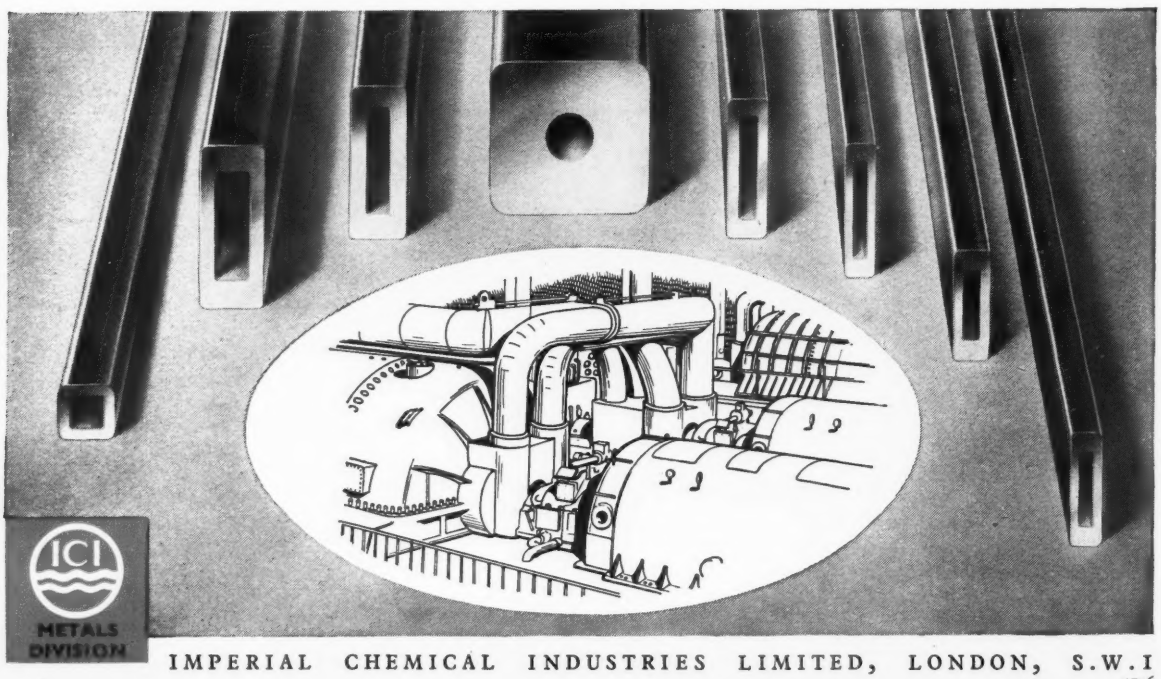
HOLLOW COPPER CONDUCTORS

Hollow copper conductors are in rapidly increasing demand for direct-cooled windings of turbo-alternators, cyclotrons and other electrical equipment where rapid dissipation of the heat generated in the windings is an important consideration.

With the largest and most up-to-date copper tube factory in Europe, I.C.I. Metals Division is well-equipped to meet this demand.

Made from H.C. or silver-bearing H.C. copper, I.C.I. hollow conductors are produced by processes that ensure good dimensional accuracy.

Square or rectangular sections with walls of uniform or varying thickness can be supplied and enquiries for sections to meet specialised requirements are welcomed.



ICI METALS DIVISION

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.I

CT16

Lionel Robinson
& Co. Ltd.

DISTRIBUTORS OF

WOLF ELECTRIC TOOLS

102 Abbey Street Accrington
Accrington 2774

7 Springfield Street Warrington
Warrington 34391/2

161-163 Eldon Street
Preston
Telephone—Preston 57975-6

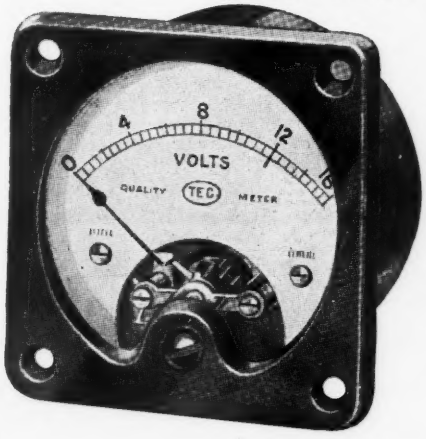
4 Staple Inn
London, W.C.1
Telephone - - HOLborn 6322

Insist on

T.E.C.

PANEL TYPE METERS
(Up to 3 inches)

Power and Distribution Transformers to 100 KVA, Low Voltage, Flash Test and Rectifier Units, Metal Work, Light Assembly, Slotted Angles, etc.

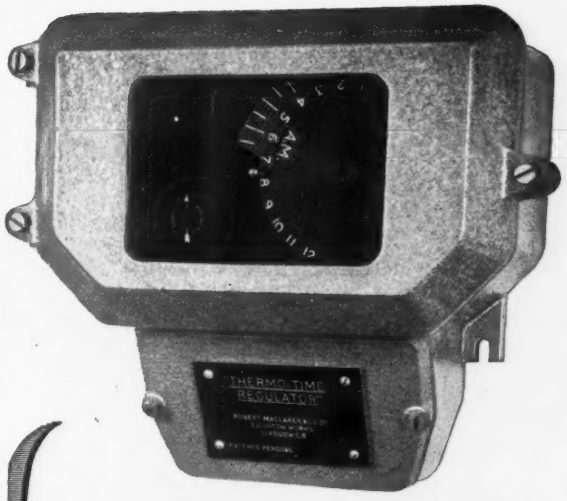


Full Catalogue on request:—

ROUND, SQUARE AND RECTANGULAR VOLT AND AMMETERS TO SPECIFICATION

The
TRANSFORMER & ELECTRICAL CO. LTD.
HONYWOOD RD., BASILDON, ESSEX
Telephone: Basildon 20491/3

H



MACLAREN THERMO-TIME REGULATOR

an entirely new development

in heating installation control, combining a Thermostat and a Time Clock in one unit. The control regulates the switch-on time of a heating system over infinitely variable conditions of outside temperature and gives the required temperature at the required time inside the building, thus ensuring the maximum economy of fuel with the maximum comfort, without supervision, on any type of installation.

Specialists of long experience in the design and manufacture of

THERMOSTATS
for electricity, gas oil or steam
PRESSURE REGULATORS, FLOAT SWITCHES, ETC.

Robert Maclaren & Co. Ltd.
EGLINTON WORKS, KILBIRNIE STREET, GLASGOW, C.5
Phone: SOUTH 2011/2/3 Grams: "SOCKET, GLASGOW"

Every length an advertisement in itself

GEORGE BURN LIMITED

TESTED SUPER STEEL
CONDUIT

Unvarying in quality and made to British Standard Specification

Supplies obtainable through leading wholesalers

GEORGE BURN LIMITED
CITY TUBE & CONDUIT MILLS
SMETHWICK, BIRMINGHAM
Telephone: Smethwick 1511 (5 lines)

London: 2 Deanway, N.2. Liverpool: 24 Chapel Street, 2.
Edinburgh: 22 Shandon Place, 11

resistance wire and tape

of highest grade in

NICKEL CHROMIUM
NICKEL CHROMIUM IRON
COPPER NICKEL

also

PURE NICKEL
STAINLESS STEEL
AND TITANIUM WIRE

AW

ALLOY WIRE CO. LTD.
Lawrence Lane · Old Hill
Staffordshire
Telephone: Cradley Heath 6575

TESTOSCOPE MAINS TESTER

For high and low voltage testing, Standard Model: range 100/850 volts A.C. or D.C. Dual Model: range 1/30 and 100/850 volts A.C. or D.C. Send for leaflet 25F. 16-page booklet "Hints on Electrical Testing" now available—1/- post free

Runbaken MANCHESTER 1

For Early Delivery

Vincent

CHANGE-OVER SWITCHES
30-800 AMPS 2-3-4-POLE

Vincent Switchgear Manufacturing Co. Ltd.
Vincent Works, Sampson Road North, Birmingham 11
Telephone: VICtoria 2853 *Telegrams:* "ABBOGEAR BIRMINGHAM"

Beautiful Yorkshire, *Bolton Abbey, Wharfedale*

BIRKBYS LTD · LIVERSEDGE · YORKSHIRE

"ELO" SYNTHETIC RESIN PRODUCTS

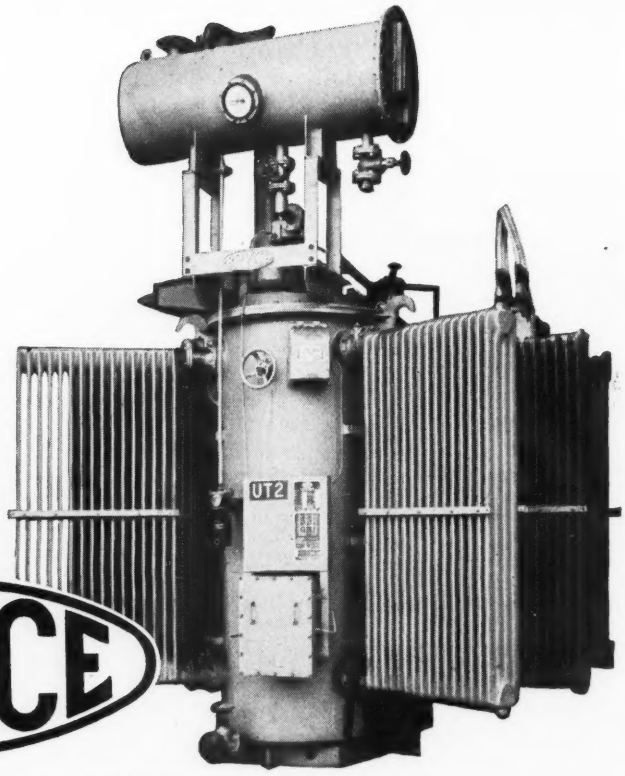
"ELO" MOULDINGS for all classes of industry
High grade "ELO" MOULDING MATERIALS

"ELO" RESINS for all Bonding, Laminating, Abrasive, and Friction material applications. Anti-Friction Resin for Fabric Bearings. Resins for Textile Paper Tubes and Bobbins. Cements, Lacquers, Insulating Varnishes.

London Office: 79 BAKER STREET, W.1.

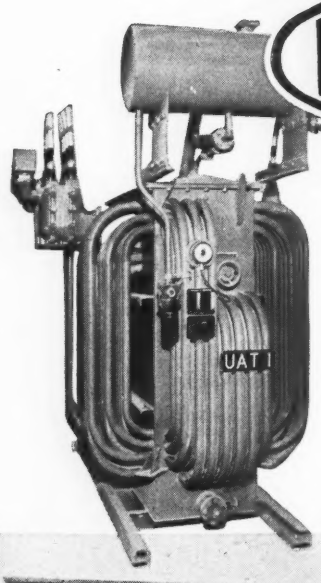
Installations at South Denes

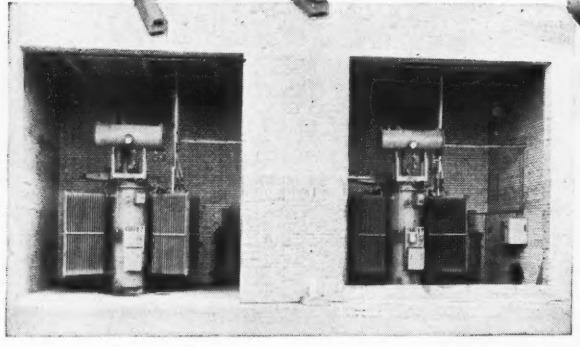
New Power Station for C.E.A. EASTERN DIVISION



14 BRYCE Transformers

Ten of the fourteen Bryce Transformers for auxiliary services at the new C.E.A. Eastern Division Power Station are now in service.
They range from 5,000 kVA, 11,000/3,450 volts to 400 kVA, 3,300/433 volts.



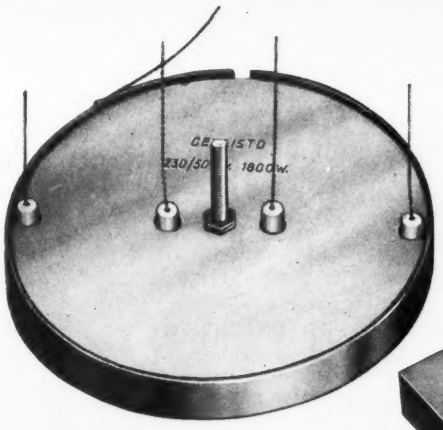


The examples illustrated are (top right and bottom left) 5,000 kVA, 11,000/3,450 volts; (upper left) 1,000 kVA, 3,300/433 volts; and (bottom right) 400 kVA, 3,300/433 volts.

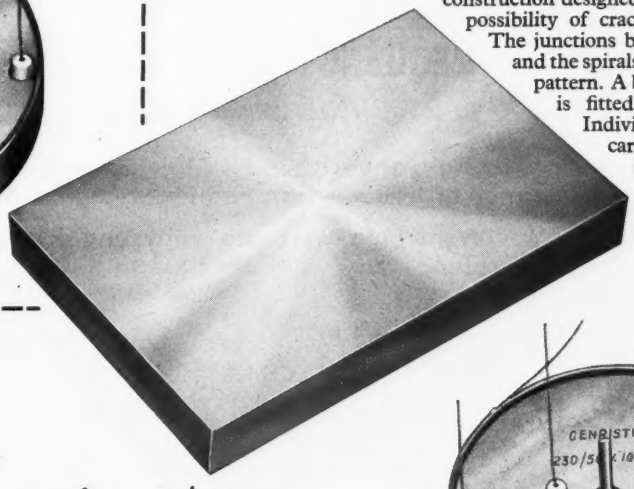
BRYCE ELECTRIC CONSTRUCTION COMPANY LTD.

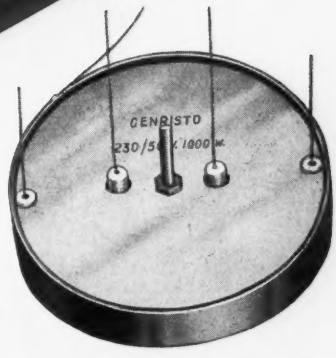
KELVIN WORKS HACKBRIDGE SURREY • TELEPHONE: WALLINGTON 2601
In Association with HACKBRIDGE CABLE CO. LTD.

SOLID HOT PLATES FOR MODERN COOKERS



Our solid boiling plates are of special construction designed to eliminate the possibility of cracking in service. The junctions between the leads and the spirals are of improved pattern. A brazed earth lead is fitted on all plates. Individually packed in cartons to facilitate storage.





GENRISTD

The elements of Good Heating

GENRISTO LTD., OSMASTON ST., NOTTINGHAM. Tel.: Nottm. 52148
Wholesale Only

MEGOHMOID

A specialised service to cable manufacturers . . .

Lindsay & Williams LIMITED

Proofed Insulating Cloths and Tapes for Rubber and Power Cables
Bitumenised Hessian and Bitumenised Cotton Tapes
Adhesive Insulating Tapes

MEGOHMOID TRADE Ω MARK REGISTERED

LINDSAY & WILLIAMS LIMITED *Established 1912*

OPENSHAW BRIDGE WORKS, MANCHESTER 11

Telephone: EASt 2686 (4 Lines)
"Telex 66269"

Grams:
"Megohm Telex Manchester"

M101

NEWTON-DERBY

NBD

HIGH FREQUENCY ALTERNATORS

400 to 2400 cycles per second

Our range of H.F. Alternators covers an extensive range of frequencies and outputs up to 30 K.V.A.

We would welcome your enquiries for this class of machine.

Also manufacturers of:-

AUTOMATIC VOLTAGE REGULATORS

•

ROTARY TRANSFORMERS AND CONVERTERS

•

MOTOR GENERATORS

SBAC THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS

NEWTON BROTHERS (DERBY) LTD.

ELECTRICAL PLANT SPECIALISTS

HEAD OFFICE & WORKS: ALFRETON RD., DERBY. PHONE: DERBY 47676 (4 LINES). GRAMS: DYNAMO, DERBY

LONDON OFFICE: IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2. TEL: 0623 HOLBORN

CHADDERTON GENERATING STATION MANCHESTER

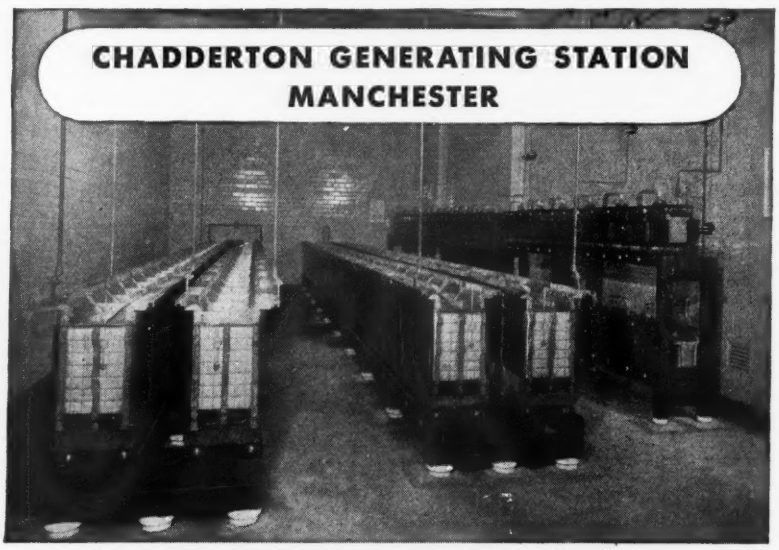


Illustration shows the installation of a 240 VOLT TUNGSTONE BATTERY Type B.S.S.D.11 500 A.H. and 2 Batteries of TUNGSTONE enclosed type, of 100 A.H. and 75 A.H. respectively at Chadderton Generating Station.

Photograph by permission of the British Electricity Authority.

Consulting Engineers: Messrs. Kennedy & Donkin.

TUNGSTONE BATTERIES have been designed to meet Post Office and British Standard Specifications. They are being used in Power Stations and Telephone Exchanges all over the British Isles; in Australia, India, New Zealand, West Indies, etc.

TUNGSTONE

STORAGE BATTERIES

TUNGSTONE PRODUCTS LIMITED

ST. BRIDE'S HOUSE, SALISBURY SQUARE, LONDON, E.C.4

Telephone: FLE 8011 Works: MARKET HARBOROUGH, LEICS

ICFB (ER)

Christmas Greetings

Every
good
wish
for a
Happy Christmas
and a
prosperous
New Year
to all our good
friends throughout the
Trade

KEMPSTON **CRYSELCO** BEDFORD

Branches BIRMINGHAM • BRISTOL • BURY ST EDMUNDS • CARDIFF • GLASGOW • LEEDS
LEICESTER • LIVERPOOL • LONDON • MANCHESTER • NEWCASTLE • NOTTINGHAM • SOUTHAMPTON

GOODMANS —

loud speakers in favour of

ALCHO-RE

Goodmans Industries Ltd. are famous for the production of loud speakers. A vital part of every speaker they produce is the copperbraid joining outlet terminals to the cone. Flexing thousands of times a minute the braid must be soldered, without danger of breakage or dry or H.R. joints.

For this reason — and also because they reduce soldering times — Alcho-Re fluxes are specified. Produced by FRY'S especially for the Electrical Industry they ensure strong bonding and non-corrosive after effects. Please write for samples and prices.

Export enquiries invited.

FRY'S Metal Foundries Limited

Tandem Works, Merton Abbey, London, S.W.19

and at MANCHESTER - BRISTOL - GLASGOW and DUBLIN

MRP 61

ASCOT

Quality lamps and tubes

ASCOT LAMPS & LIGHTING LIMITED

ARCOLA STREET · LONDON E8 · ENGLAND

WHG/L4

750,000 PLUS...

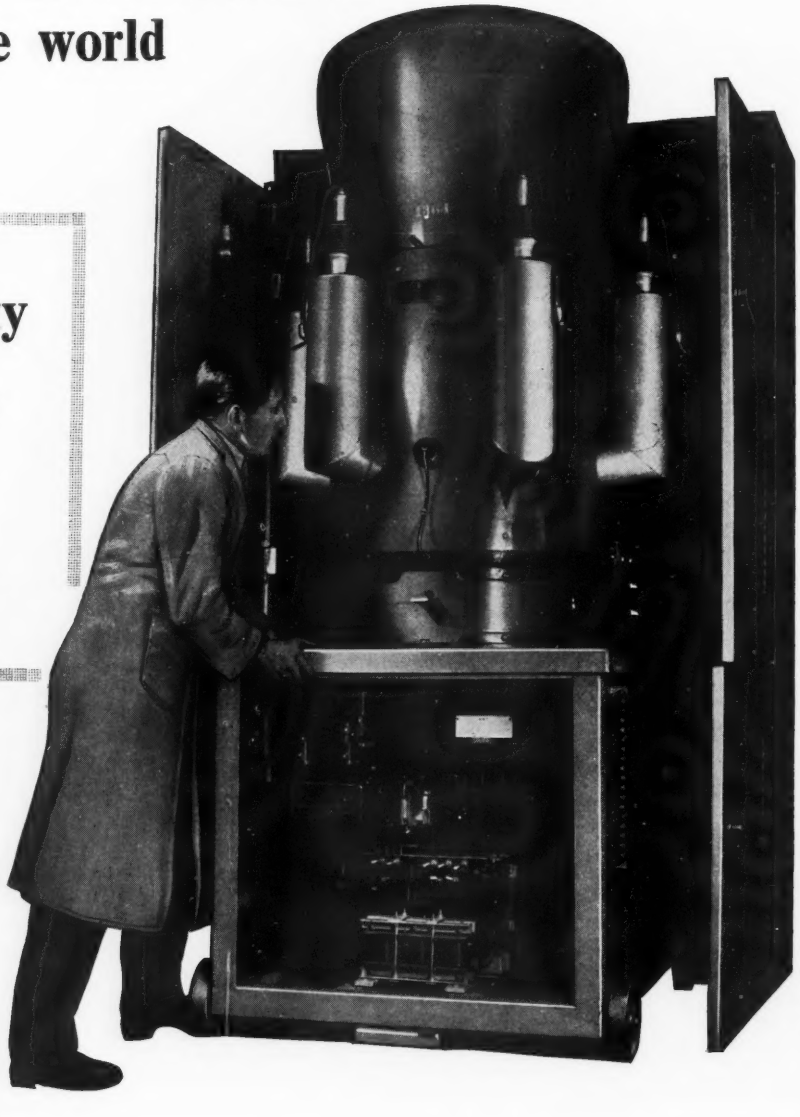
that is the G.E.C. record of pumpless rectifier kW's installed all over the world

For reliability

and simplicity of

installation

and maintenance



G.E.C.

drawout steel tank rectifiers

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

safety first

with SIEMENS EDISWAN **earth leakage circuit breakers**

Three types of earth leakage circuit breakers make up the Siemens Ediswan range of these established safety switches. Voltage operated and complying with B.S. requirements, they are of improved design and ensure a wide margin of safety. Tripping mechanism is simple and robust; cases and covers give good protection against heat, cold, damp, dust and insects. For full details, please ask for catalogue Z174/57.

Types TP and TP & N Circuit Breakers

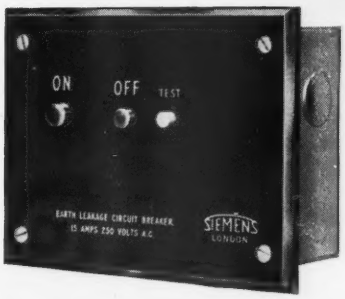
A new addition to the range intended for industrial use; suitable for 60 amp. 500v. circuit. Available with or without overload coils on each phase, and with or without neutral link. Extended terminal covers, fitted with rubber gaskets, can be supplied for use with T.R.S. cable or conduit.

Type ET.60D Circuit Breaker

Suitable for 60 amp. 250v. circuit; for use as consumers' main switch in small dwellings, especially in rural areas, and for protection of farm equipment or industrial tools. Overload protection can be supplied, and extended terminal covers, fitted with rubber gaskets, are available for use with T.R.S. cable or conduit.

'Safetrip' Type EL15 Switch Socket

Suitable for 13/15 amp. 250v. circuit; complete earth leakage protection for domestic apparatus using up to 3 kw. Available also as switch only.



Pamphlet No. ST.2 gives details of Siemens Ediswan Monitored Earth Leakage Circuit Breaker Units for automatic switching off should the earth wires become disconnected or fractured.

SIEMENS EDISON SWAN LTD
An A.E.I. Company
Distribution Equipment Division
38-39 Upper Thames Street, London EC4
Telephone : Central 2332
Telegrams : Sieswan Cent London

11375

Backer elements

..... in the LABORATORY

Flask Heaters. Illustration shows a Three Heat Laboratory Flask Heater Rating: 750w. Voltage: 200/250. Sheath material: Inconel.

World beating tailored heating!

Heat — Safe heat — exactly where required is demanded by most modern industries to-day. Our whole business is to design and provide electric heating elements exactly "tailored" to the specific needs of your process. Let us help you to solve your particular problem — Ask one of our technical Representatives to call and discuss it.

BACKER ELECTRIC COMPANY LIMITED
ROTHERHAM YORKS

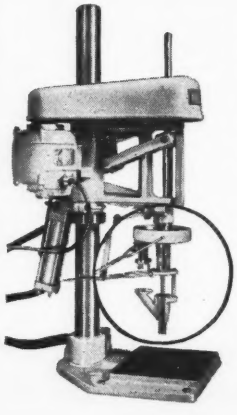
WEATHERPROOF METAL-CLAD SOCKETS, PLUGS, SWITCH SOCKETS etc.
for all electrical purposes

SIMMONDS & STOKES (NIPHAN) LTD
MANUFACTURING ELECTRICAL ENGINEERS
Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

For Faster Assembly

of electrical components,
SWITCHES
CONTACTORS
LAMP HOLDERS
TERMINAL BLOCKS, etc.

THE NEW RUSSELL AUTO-FEED SCREW OR PIN DRIVING MACHINES



These machines incorporate the famous **Russell Auto-feed screw or pin driving heads.** By interchanging heads each machine can be easily adapted to cover a wide range of screw or pin types and sizes.

Hand operated — Foot operated or fully automatic models available.

Heads can be purchased separately for use as attachments. Special purpose equipment designed and built.

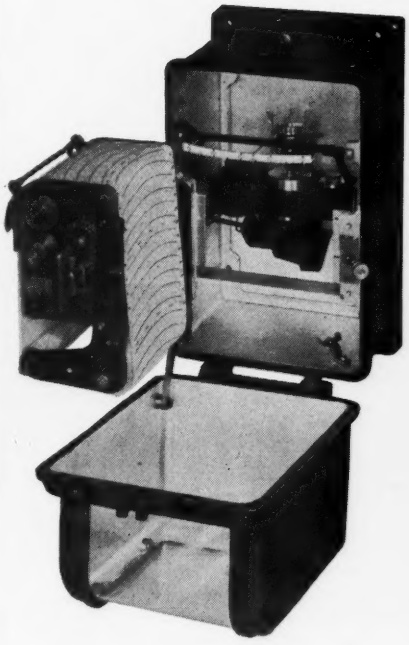
RUSSELL AUTO-FEED SCREWDRIVERS
(Branch of Needle Industries Limited)
STUDLEY, REDDITCH, ENGLAND. Tel: Redditch 74

NALDERS

GRAPHIC RECORDING INSTRUMENTS

SUPPLIED FOR

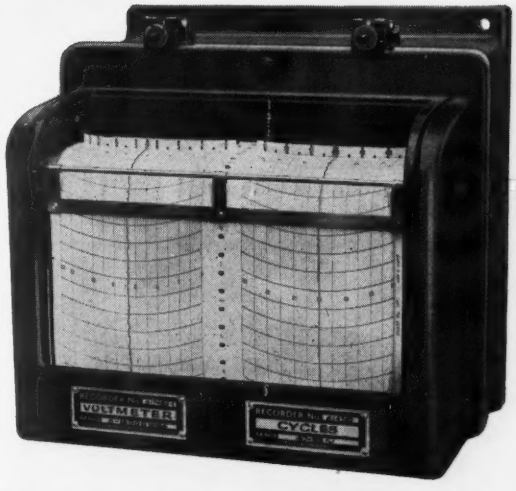
AMMETERS • WATTMETERS
POWER FACTOR METERS • FREQUENCY METERS



Nalders Graphic Recording Instruments illustrated at left and below show the Standard and Duplex models, switchboard pattern. Picture on extreme left shows the simplicity of opening the instruments for recharting. A complete range of recording instruments, for both switchboard and portable patterns, is offered for all meters.

Nalders Recording Instruments are made to their usual high level of accuracy and are well within the requirements of B.S. Specification.

Chart driving mechanism is of improved type which ensures extremely accurate timing. Standard chart speed is set for 1" per hour but full adjustment is provided for multi-speed charts. When running at Standard Speed the 65 ft. chart rolls are sufficient for one month's record. Clocks are fitted hand wound or synchronous motor as desired.



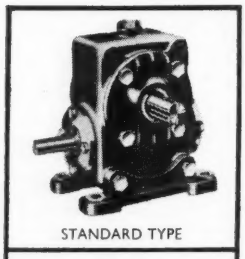
NALDERS PRODUCTS INCLUDE:
Protective Relays, Vectormeters
Automatic Earth Proving Supply Switches
'Bijou' Circuit Breakers
Flameproof Instruments

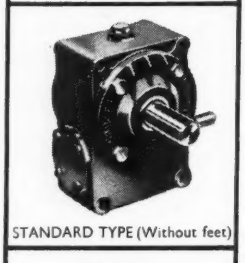
All conform to B.S. Specification

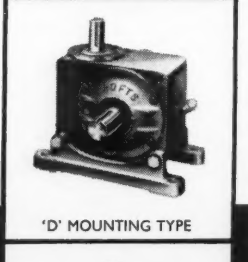
NALDER BROS. & THOMPSON LTD. Dalston Lane Wks., London, E.8
Telegrams Occlude Hack London Telephone Clissold 2365 (4 lines)

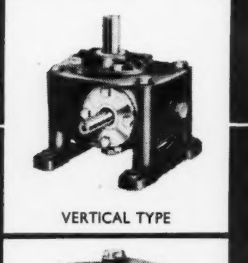
BMJ

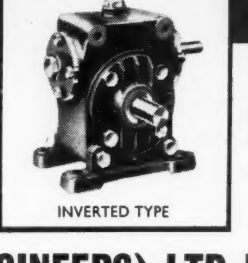
Crofts universal mounting worm reduction gears


STANDARD TYPE

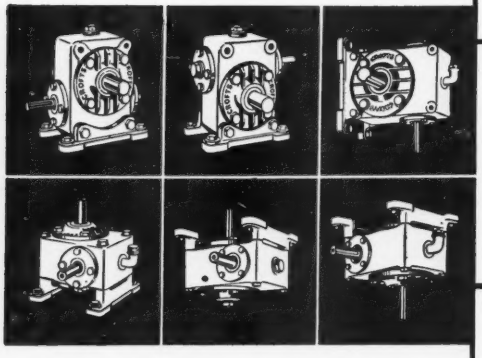

STANDARD TYPE (Without feet)

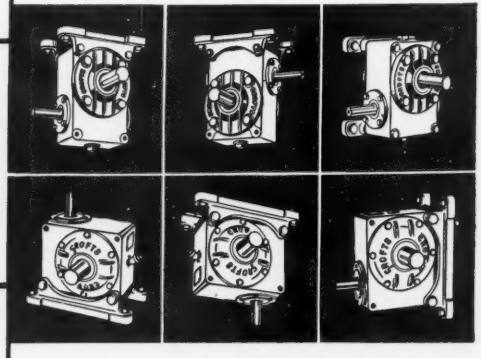

'D' MOUNTING TYPE


VERTICAL TYPE


INVERTED TYPE

Using any of the three foot designs or by bolting the basic gear without feet directly on to your machinery you can get any mounting position you like with this truly universal mounting worm reduction gear. Any size is available as a complete worm geared motor.



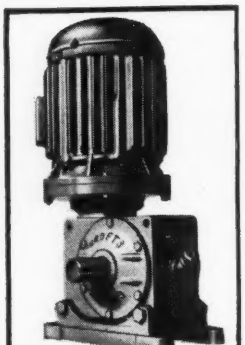


FOUR SIZES : 1⅛", 1¾", 2¼", 3" CENTRES
POWERS : From ·01 to 4hp
STOCK RATIOS : From 5:1 to 60:1
Non-standard ratios supplied at short notice

FOR A QUICK QUOTATION RING BRADFORD 65251 Ext. 555
OR CONTACT YOUR NEAREST CROFTS BRANCH OFFICE

ASK FOR PUBLICATION 5515

CROFTS (ENGINEERS) LTD BRADFORD 3 ENGLAND

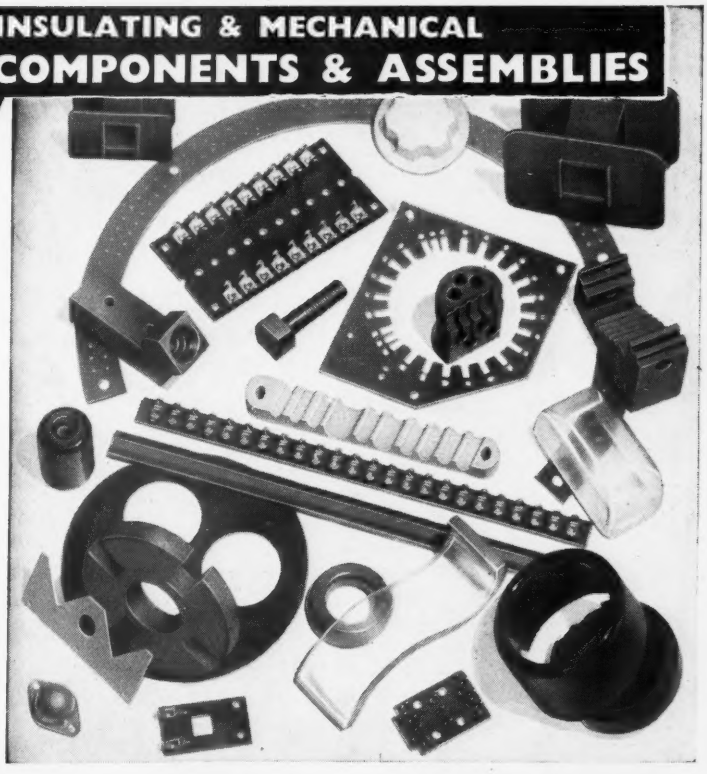

GEARED MOTOR UNIT

Telephone : 65251 (20 lines)
Telegrams : 'Crofters Bradford Telex' Telex 51186

BRANCHES AT
Belfast
Birmingham
Bristol
Cardiff
Dublin
Glasgow
Leeds
Liverpool
London
Manchester
Newcastle
Northampton
Nottingham
Sheffield
Stoke

REINFORCED PLASTICS
Comoys

INSULATING & MECHANICAL COMPONENTS & ASSEMBLIES



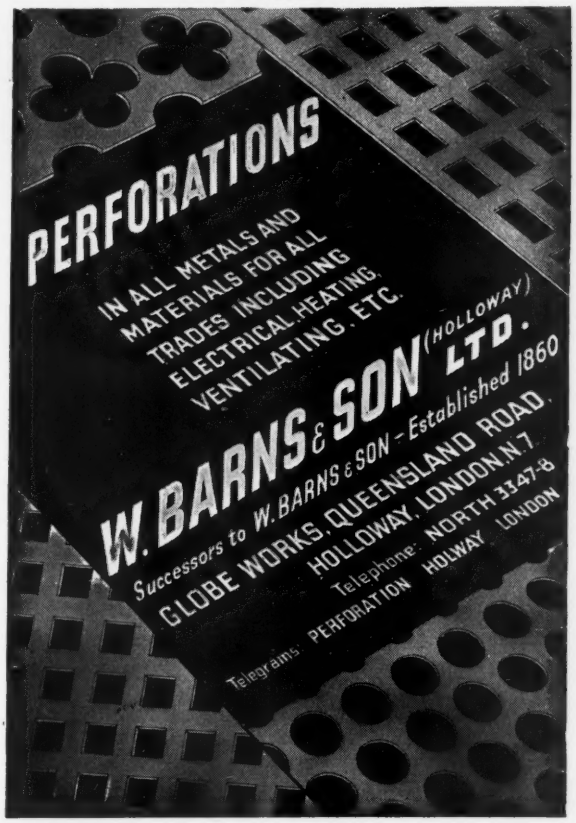
MACHINED & FABRICATED
from S.R.B. Laminates, Vulcanised Fibre, Ebonite, Cast Resins, Nylon.

COMPRESSION MOULDINGS
in Phenolic and Urea Powders; Fabric, Paper, Wood and Glass Laminates; Macerated Fabric and Glass Reinforced materials.

FORMING AND MACHINING
Perspex, P.V.C. Styrene, Cellulose Acetate, Phenolic Laminates, Glass Mat and Fabrics.

STOCKHOLDERS of SRB Fabric, Paper, Glass and Wood Laminates; Perspex. Ebonite, Vulcanised Fibre.

H. COMOY & CO. LTD. (*Plastics Division*) **86-92 PENTONVILLE RD. · LONDON · N.1** *TERminus* 1089


PERFORATIONS
IN ALL METALS AND MATERIALS FOR ALL TRADES INCLUDING ELECTRICAL, HEATING, VENTILATING, ETC.
W. BARNS & SON (HOLLOWAY) LTD.
Successors to W. BARNS & SON - Established 1860
GLOBE WORKS, QUEENSLAND ROAD, HOLLOWAY, LONDON, N.7
Telephone: NORTH 3347-8
Telegrams: PERFORATION HOLWAY LONDON

PITMAN TECHNICAL BOOKS

GENERATION, TRANSMISSION AND UTILIZATION OF ELECTRICAL POWER

By A. T. Starr, M.A., Ph.D., M.I.E.E. Fourth Edition. This book has been specially written to meet the requirements of the "Electrical Power" syllabus of the Engineering Degree. It covers a very wide field and yet deals with each branch of the subject in considerable detail. In this new edition the author has added an additional Appendix on nuclear energy, and an outline of the Calder Hall Station. 27/6 net.

APPLIED ANALYSIS

By Cornelius Lanczos. A philosophical and strictly theoretical approach to mathematical methods used in the numerical solution of physical and engineering problems. Written by a past-collaborator with Einstein, it develops an appreciation of, and an ability to use, a few fundamental but powerful mathematical principles. 55/- net.

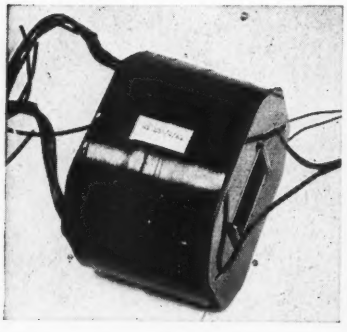
RADIO UPKEEP AND REPAIRS

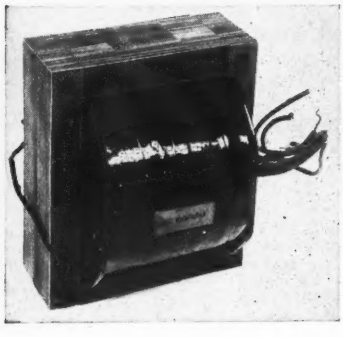
By Alfred T. Witts, A.M.I.E.E., Chartered Electrical Engineer. 8th Edition. This practical handbook explains in an easy-to-follow-style how to locate faults, how to remedy them and how to keep modern radio receiver apparatus in the best possible working condition. It forms a most valuable book for radio service engineers and mechanics, and for all who require a practical book of "do's and don'ts". 15/- net.

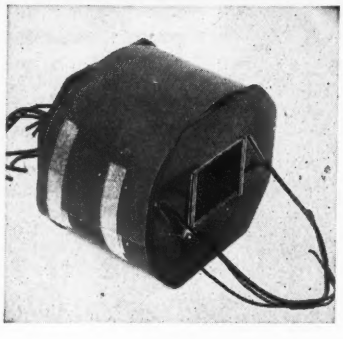
PARKER STREET, KINGSWAY, LONDON, WC2

I was *shocked!*
(said Timothy Tapir)

Tim Tapirs long enquiring snout
As Tapirologists agree
Is not designed to root about
The realms of 'electricitee'







So when you're wiring up a job
Where Ohm's law is applicable
Use DILEC Tape for Tapir's sake
And make him more amicable.

DILEC tape has been specially developed for the electrical industry.

DILEC is imperishable—**there is no adhesive liable to breakdown or perish** under severe atmospheric or other conditions. It is non-inflammable, will not cone or telescope, is impervious to moisture and is highly resistant to most acids, chemicals, atmospheric conditions etc.

DILEC has a high dielectric strength, a high tensil strength and excellent elongation to enable it to conform easily to all surfaces.

DILEC is easy to handle and clean in use. It can be heat sealed, cemented or H.F. welded.

...take a tip from Timothy Tapir

use DILEC

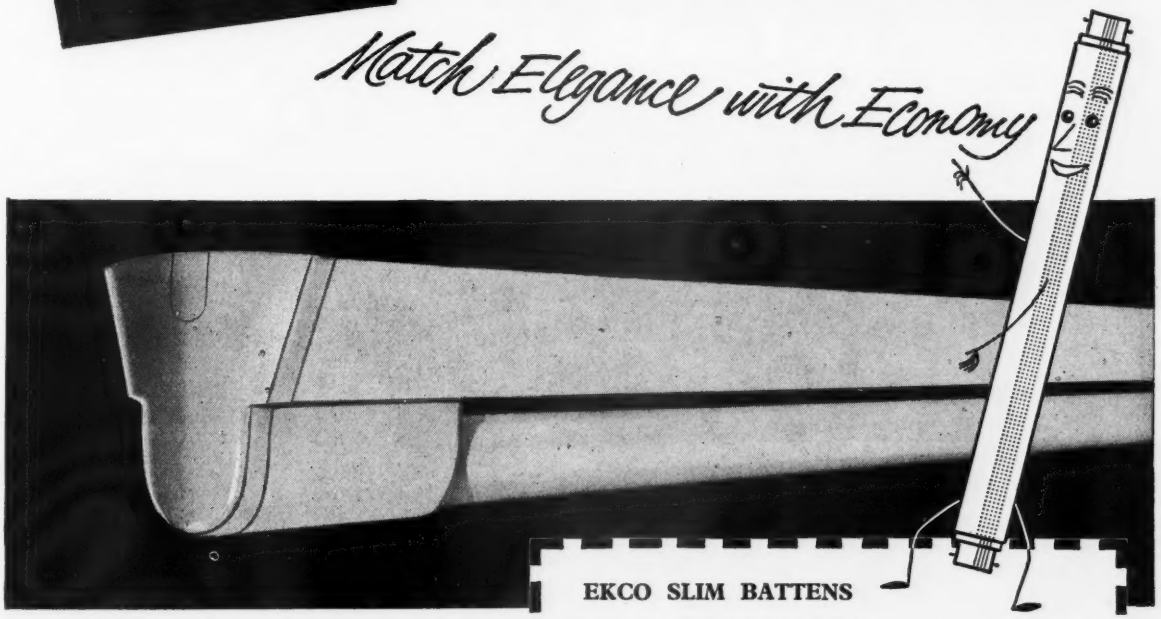
THE DEPENDABLE ELECTRICAL TAPE BY **Gosheron**

JOHN GOSHERON & CO. LTD.

THE PACKAGING TAPE CENTRE *(Regd.)* · 79-81 ALBERT EMBANKMENT, LONDON, S.E.11: RELIANCE 7600

EKCO SLIM Battens

Match Elegance with Economy



EKCO slim batten fittings for fluorescent tubes have quickly established themselves as favourites among discriminating buyers. The slender modern designs and simplicity of installation will appeal instantly to your taste and sense of economy. Finished in high gloss white stoved enamel for long life, EKCO slim battens are packed individually for easy handling, storage and dispatch.

EKCO SLIM BATTENS

F51035	5 ft. FITTING for 1-80W Tube	£4 9 4
F51035	5 ft. „ Packed complete with Tube	* £5 5 0
F41035	4 ft. FITTING for 1-40W Tube	£3 16 10
F41035	4 ft. „ Packed complete with Tube	* £4 11 0
F21035	2 ft. FITTING for 1-20W Tube	£3 4 4
F21035	2 ft. „ Packed complete with Tube	* £3 17 0

* Price includes P.T. on tube. *White or Warm White tube.*

Have you a lighting problem?

Then the EKCO Lighting Advisory Service is available to help you. There is an office in your vicinity. So ask us to send a qualified lighting engineer to discuss your problem with you. There is no obligation and the service is entirely free.

EKCO Lighting Fittings

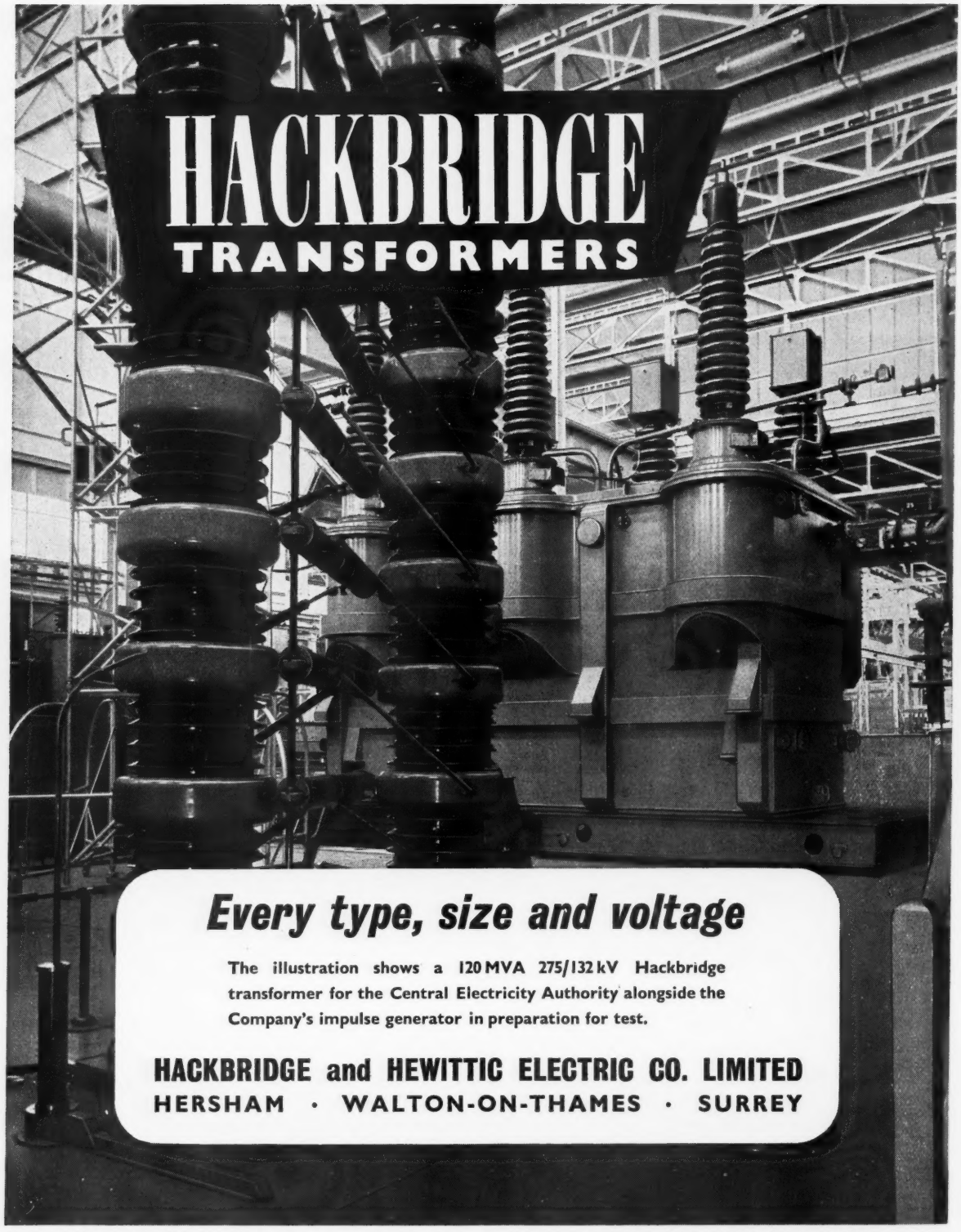
Switch *brightly* to EKCO

EKCO-ENSIGN ELECTRIC LTD., 45 ESSEX STREET, STRAND, LONDON, W.C.2. Tel: CITY 8951

SALES OFFICES, ILLUMINATING ENGINEERING DEPTS., SHOWROOMS AND DEPOTS

SOUTHERN: 45 Essex Street, London, W.C.2 Tel: City 8951
NORTHERN: Blackett St., Fairfield St., Manchester 12. Tel: Ardwick 4661
MIDLANDS: 68 Caroline Street, Birmingham 3. Tel: Central 2997
E. MIDLANDS: 27 High Pavement, Nottingham. Tel: N'ham 53183/4
SCOTTISH: 26 India Street, Glasgow, C.2. Tel: Central 2012
SOUTH WALES: 50 Bridge Street, Cardiff. Tel: Cardiff 33803/4

EL54


HACKBRIDGE
TRANSFORMERS
Every type, size and voltage
The illustration shows a 120 MVA 275/132 kV Hackbridge transformer for the Central Electricity Authority alongside the Company's impulse generator in preparation for test.
HACKBRIDGE and HEWITTIC ELECTRIC CO. LIMITED
HERSHAM · WALTON-ON-THAMES · SURREY

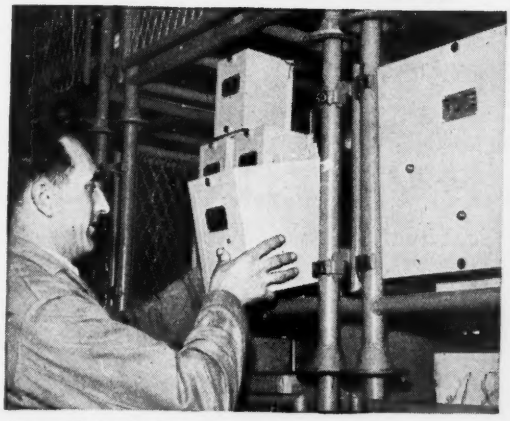
OVERSEAS REPRESENTATIVES: ARGENTINA: H. A. Roberts & Cia. S.R.L., Buenos Aires. AUSTRALIA: Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W., Queensland, W. Australia: Elder Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. BELGIUM & LUXEMBOURG: M. Dorfman, 5 Avenue des Phalenes, Brussels. BRAZIL: Oscar G. Mors, Sao Paulo. BURMA: Neonlite Manufacturing & Trading Co. Ltd., Rangoon. CANADA: Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. CEYLON: Envee Ess Ltd., Colombo. CHILE: Sociedad Importadora del Pacifico Ltda., Santiago. EAST AFRICA: Gerald Hoe (Lighting) Ltd., Nairobi. EGYPT: Giacomo Cohenca Fils, S.A.E., Cairo. FINLAND: Sähkö-ja Koneliike O.Y. Hermes, Helsinki. GHANA, NIGERIA & SIERRA LEONE: Glyndova Ltd. NETHERLANDS: J. Kater, E.I. Ouderkerk a.d. Amstel, Amsteldijk Noord 103. INDIA: Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras 1. IRAQ: J. P. Bahoshy Bros., Baghdad. MALAYA, SINGAPORE & BORNEO: Harper, Gilfillan & Co. Ltd., Kuala Lumpur. NEW ZEALAND: Richardson, McCabe & Co. Ltd., Wellington, etc. SOUTH AFRICA: Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. CENTRAL AFRICAN FEDERATION: Arthur Trevor Williams (Pty.) Ltd., Salisbury. THAILAND: Vichien Phanich Co. Ltd., Bangkok. TRINIDAD & TOBAGO: Thomas Peake & Co., Port of Spain. TURKEY: Dr. H. Salim öker, Ankara. U.S.A.: Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania.

SenTerCet

RECTIFIER EQUIPMENTS

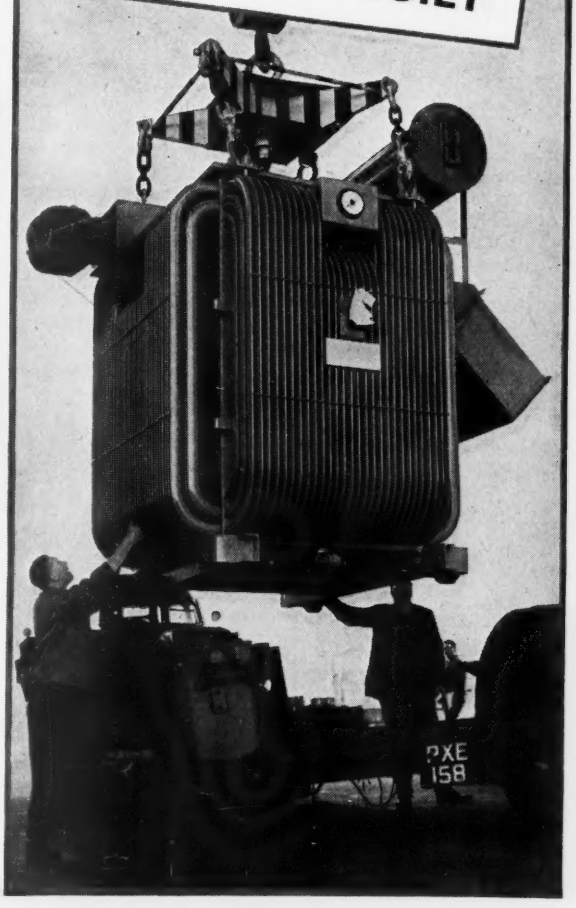
SenTerCet RECTIFIER EQUIPMENT
REGISTERED TRADE MARK

FROM STOCK RANGES



An "off-the-shelf" service of SenTerCet transformer/rectifier equipments is available from Standard's Harlow factory.

OR CUSTOM BUILT



A SenTerCet rectifier equipment being loaded for departure to the United Kingdom Atomic Energy Authority, Harwell. The rectifier, rated at 26,000 volts 4 amperes continuous, will be used in nuclear research.

Standard CAN SUPPLY AN EQUIPMENT TO MEET YOUR A.C.–D.C. CONVERSION REQUIREMENTS

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

RECTIFIER DIVISION: EDINBURGH WAY • HARLOW • ESSEX

I

RESISTANCE WIRES

TOPHET

STAINLESS STEEL WIRES

The 'Tophet' range of resistance materials is eminently suitable for use under the most exacting conditions as the physical and mechanical properties always remain constant, ensuring long and efficient service.
Our RESISTANCE HANDBOOK gives complete electrical and physical data regarding 'Tophet' resistance wires, stainless steels and ultra fine wire, as well as particulars of our 'Truflex' thermostatic bimetal.

Manufactured by **GILBY-BRUNTON LIMITED**
HEAD OFFICE & WORKS: SEAMILL, MUSSELBURGH, SCOTLAND
Telephone: Musselburgh 2369
LONDON OFFICE: 47 WHITEHALL, S.W.1. *Tel: WHitehall 6058*

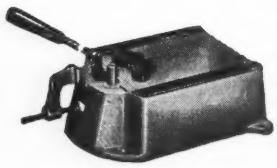
HYDE FOOT-OPERATED WIRE STRIPPER

Strips a wide range of insulated wires and small flexible cables up to ¼" outside diameter. Operating in one quick, effortless action, the stripper will not nick or damage wires.

HYDE E-Z WIRE STRIPPER

Used by hundreds of manufacturers, contractors and service agents, Precision stripping with the E-Z saves wasting wire, prevents nicking and protects the user's fingers.

Stripping without teasing



HYDE BENCH-TYPE CABLE STRIPPER

Strips insulation from cables up to ⅝" outside diameter, no splaying, no nicking, and one single movement does the whole job quickly and cleanly.

The days of clumsy stripping with knife or pliers have gone — the efficient, modern method is to use HYDE wire and cable strippers. Adjustable stops control length of strip. For greater production and perfect results without skill or experience, HYDE strippers are essential.

Obtainable from all good Tool Dealers or directly from the makers:

J. B. HYDE & CO. LTD.
Altrincham Road
WYTHENSHAWE, MANCHESTER.
Telephone: WYThenshawe 2850.
Telegrams: "Braiding, Wythenshawe"

Thermalair

HEATING and VENTILATING EQUIPMENTS

10 kW FAN UNIT HEATER

- Thermal Safety Switch
- Summer Ventilation
- Adjustable Louvres
- Accessible for service
- Economical and easy to install

10 kW Fan Unit Heater £29.0.6 list

Specification—

Casing: Aluminium Alloy of high tensile strength.
Elements: High-grade Nickel Chrome. Black Heat, easily replaceable.
Motor: Shaded Pole Single Phase with large bearing surface. Silent in operation.
Finish: Polychromatic Bronze.

H.V.E. (ELECTRIC) LTD.

Viaduct Works, Kirkstall Rd., Leeds 4
Phone: Leeds 29315 (3 lines)

Protection by...

PARATHERM

The miniature thermostat with the maximum efficiency

for all electric motors against overloads and overheating

- ¾" dia. by 7/32" thickness.
- Operating temperatures from 122 to 392 deg. F.
- Exact Operating temperatures.
- Interference free snap action.
- Suitable for mounting in windings.
- Individually tested.
- Silver contacts.

KONTAKT WERK ENZBERG

Sole Agents for United Kingdom

WALTER LOGAN & CO. LTD.
34 Oak Tree Drive, Totteridge
London, N.20. *Phone: Hillside 7319*

a.c./d.c. conversion

with Germanium Power Rectifiers

For all industrial d.c. power supplies, we offer the benefit of thirty years experience as Metal Rectifier Manufacturers.

Following copper oxide and selenium rectifiers, germanium rectifier equipments can now be provided for outputs above 25 kW where the superior efficiency and reduced bulk offers advantages.

We shall be pleased to supply details of germanium rectifier equipments.

Westinghouse Brake & Signal Co. Ltd.

(Dept. E.R. 30)
82 York Way, King's Cross, London, N.1.
Tel. TERminus 6432

Overcome by 'transport troubles'? Here's the answer..!

SORRY, TOMMY, I'M MUCH TOO TIRED..!
...ALWAYS SEEM TO HAVE A LOAD ON MY MIND...
SEND FOR A COPY OF THE ABC GOODS TRANSPORT GUIDE OLD MAN!
ABC
THINKS: THANK GOODNESS I TOOK OLD TED'S ADVICE...!
THAT EVENING

THE ABC GOODS TRANSPORT GUIDE

will tell you HOW to send ANYTHING — *ANYWHERE!*

The ABC GOODS GUIDE is an essential reference source for consignors in all industries. This new issue provides page after page of found-in-a-flash information about the nearest and quickest means of despatching *any* kind of goods. ALL long distance road transport operators (independent and British Road Services) are listed in town alphabetical order in the Transport Services ABC Section, plus up-to-date details of warehousing, wharfingers, goods-by-air, ferry services, coastwise shipping and other specialized services.

★ **JANUARY — JUNE issue ready NOW**

Half-yearly issues Jan. – June 1958; and July – Dec. 1958 **5s. each** (POST FREE)

ORDER FORM

Iliffe & Sons Ltd.,
Dorset House, Stamford St., S.E.1.

Please enter my order for.....copies of the Jan. – June 1958 and the July – Dec. 1958 issues of the ABC GOODS TRANSPORT GUIDE (at 10s. per set).
I enclose remittance of.....

NAME.....

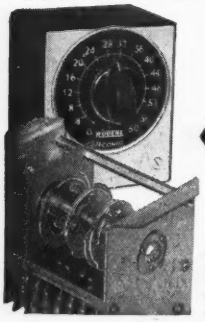
ADDRESS.....

.....

E.R.

RODENE TIMERS

FOR MOST AUTOMATIC CONTROL NEEDS!



The "Rodene" high torque instant start, synchronous Timer-Motor with built-in automatic clutch.

Self-reset and Multi-cam Timers.

Made in England.

SEND FOR LIST R.1.

D. ROBINSON & CO. Tel: DERWENT 6088
58 OAKS AVENUE, WORCESTER PARK, SURREY

NOT — just cable — *BUT*

CABLE of *Quality*

V.I.R. Taped and Braided; Tough Rubber; Lead Covered and Flexibles

WANDLE BRITISH MADE CABLE

WANDLESIDE CABLE WORKS LTD.

106 Garratt Lane • Wandsworth • London • S.W.18

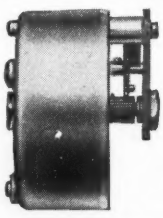
Telephone: BATtersea 2273 (5 lines) *Telegrams: "Wandleside, London"* *London Office: 21 Fitzroy St., W.1 LANgham 8317*

more power at 275 kV...

Parsons transformers

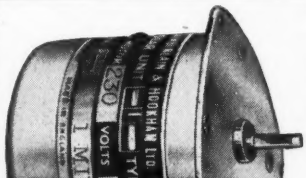
C. A. PARSONS & CO LTD · HEATON WORKS · NEWCASTLE UPON TYNE · 6

K



TYPE K

Synchronous Timing Units



TYPE B

TYPE BD

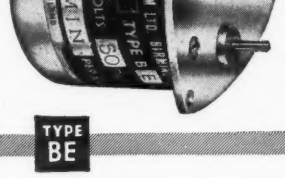
SPEED RANGES
200 R.P.M. — 1 REV. PER WEEK

FOR TECHNICAL DATA
SEE CATALOGUE SECTION 12500

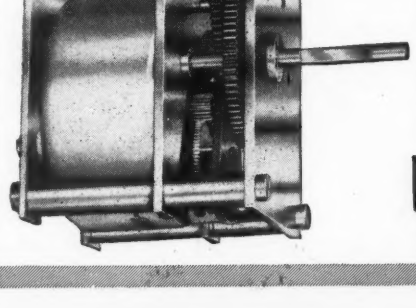
Chamberlain & Hookham Ltd

BIRMINGHAM Telephone: MIDLAND 0661 & 0662

LONDON OFFICE: MAGNET HOUSE, KINGSWAY, W.C.2



TYPE BE



TYPE BK

TYPE B, BD, BE, and BK GEAR UNITS
K TYPE MOTORS

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF HESTON AND ISLEWORTH

Street Lighting Improvement

Great West Road (A.4)

TENDERS are invited for the installation of Street Lighting to Group "A" standard along the Great West Road (A.4) from the eastern boundary of the Borough (bridge over the River Brent) to the junction with Bath Road (A.3006).

The work includes the adaptation of 214 existing steel columns with provision of new bracket arms and the supply and fixing of 294 mercury vapour lighting units complete.

On deposit of £2 2s. (returnable if a bona fide tender is received and not withdrawn) the bill of quantities, specification and form of tender may be obtained from, and conditions of contract and drawings seen at, the Borough Engineer's Department, 88, Lampton Road, Hounslow.

Tenders in sealed envelopes endorsed "Tender, Great West Road Lighting," but not indicating the sender, must be delivered to me by 10 a.m. on Wednesday, 8th January, 1958.

The Council are not bound to accept any tender.

D. MATHIESON,
Town Clerk.

Town Hall,
Hounslow. 1641

URBAN DISTRICT OF MERTON AND MORDEN

Installation of Class "A" Street Lighting

TENDERS are invited for the supply and erection of 18 140-watt Sodium Vapour and 34 2 × 80-watt Fluorescent Lanterns, complete with control gear and wiring, on 25-ft. concrete columns.

Form of tender, specification and bill of quantities may be obtained from the Engineer and Surveyor, Morden Hall, London, S.W.19, at whose office the general conditions of contract may be seen during normal office hours.

Tenders in envelopes provided must be delivered to me not later than 10 a.m. on Thursday, 2nd January, 1958.

HARRY MAY,
Clerk of the Council.

Morden Hall,
London, S.W.19.
6th December, 1957. 1640

COUNTY COUNCIL OF MIDDLESEX

Supplies Department

TENDERS are invited for supply of general service Electric Lamps and Fluorescent Tubes direct to Council Establishments for period 1st April, 1958, to 31st March, 1959. All supplies must be in accordance with the current B.S.I. specifications and proof of compliance will be needed.

Applications (stamped addressed foolscap envelope) for forms of tender and specification to Chief Supplies Officer, 245, Acton Lane, London, N.W.10.

Sealed tenders to be received by 31st December, 1957.

The Council does not bind itself to accept the lowest or any tender.

KENNETH GOODACRE,
Clerk of the County Council.

Guildhall,
Westminster, S.W.1. 1597

YORK (A) AND TADCASTER HOSPITAL MANAGEMENT COMMITTEE

Maintenance Contracts

THE Management Committee is revising its list of approved firms for works of maintenance including building, plumbing, joinery, painting, electrical and general engineering.

Firms who wish to be included in the prescribed list are invited to submit their names indicating the type of work for which they are able to contract.

The Management Committee reserve the right to include firms on the prescribed list or not, at their sole discretion.

FRANK A. MILNES,
Group Secretary.

Bootham Park,
York.
4th December, 1957. 1629

COUNTY BOROUGH OF STOCKPORT

College for Further Education, Phase 1

APPLICATIONS for invitation to tender required from :—

1. HEATING ENGINEERS for mechanical engineering services comprising large-scale heating, H.W.S. and ventilation installations.
2. ELECTRICAL ENGINEERS for installations comprising switchgear, lighting, power, low voltage, etc.

Tenders will be invited from selected list. Applications in writing to Borough Architect, Town Hall, Stockport, by 21st December, 1957. 1546

METROPOLITAN BOROUGH OF HOLBORN

Street Lighting Lanterns and Columns

HOLBORN BOROUGH COUNCIL invites manufacturers to send preliminary particulars with prices for street lanterns (colour corrected mercury) and columns (steel). Conditions and requirements as to their submission may be obtained from the Borough Engineer and Surveyor, and particulars are returnable to the Town Clerk, Town Hall, High Holborn, W.C.1, in a sealed package endorsed "Street Lighting" not later than 12 noon 31st January, 1958. 1618

CONTRACTS

THE HERTFORDSHIRE COUNTY COUNCIL invite applications for inclusion on their List of Contractors for building and maintenance works, heating and electrical works, fencing works, etc. Tenders will normally be invited from a number of firms on the list, but the County Council reserve the right to ask for other tenders.

Application forms from the Clerk of the County Council, County Hall, Hertford.

Contractors who have already applied for inclusion on the list need not apply again. 1639

CITY OF MANCHESTER

TENDERS invited for Electrical Installation to Irwell College for Further Education (Phase 2).

Specification and drawings from City Architect, P.O. Box 488, Town Hall, Manchester. Tenders returnable by 30th December, 1957. 1596

CHRISTMAS

ADVERTISEMENTS for the issue of 20th December have now closed for press.

Advertisements for 27th December are accepted up to **First Post on Thursday, 19th December,** and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

SITUATIONS VACANT

THE JACKSON ELECTRIC STOVE CO. LTD.

Dallow Road, Luton, Beds.

IN planning a further expansion of our Sales Force, applications are invited for the nine vacancies listed below :—

AREA SALES MANAGER (London). This is a senior position and the successful applicant must preferably be under 40 years of age and resident in or near London. He must have a first-class record of sales of domestic appliances to all outlets in the area covered by the four Electricity Boards in Southern and Eastern England. Full experience in the organisation and control of sales staff is vital, and the man appointed will be directly responsible to the Director in charge of sales.

SPECIALIST SALESMEN FOR LARGE COOKING APPARATUS are invited to apply for positions as representatives. Three representatives are required to cover the Midlands, North of England, Wales and South West with bases in Birmingham, Leeds and Cardiff respectively. Preference will be given to applicants who have good existing connections, a thorough knowledge of large installations and kitchen planning, are willing to travel, and under 40 years of age.

JUNIOR REPRESENTATIVES, two based in London and one each in Liverpool and Leeds. Age approximately 25-30 years and preferably with existing and successful connections amongst wholesalers, contractors, retailers, large stores, chain stores, etc.

A DEMONSTRATOR is required, based on our London branch, preferably with E.A.W. Certificate; must be thoroughly experienced in cooking, lecture demonstrating, and in the sale of apparatus. Age about 25 years.

Applicants should be car drivers, with a clean current driving licence and, with the exception of the two Junior London Representatives and Demonstrator, car allowances will be paid on a combined standing charge and mileage basis.

Please state present salary and that desired for the position, which should be specified, for which application is being made. All positions are pensionable.

Applications giving full particulars of previous experience, which will be treated in the strictest confidence, should be addressed to the Personnel Executive at the above address. Consideration will not be given to applicants who do not comply with the various requirements outlined above. 1608

BARROW IRONWORKS LIMITED

Barrow-in-Furness

ASSISTANT ELECTRICAL ENGINEER required with sound technical training and practical experience on maintenance, installation, generation and control equipments up to 6,600 v. A.C. On heavy plant as associated with blast furnaces.

The post is superannuable.

Reply, giving full details of education, training etc., to Managing Director, Barrow Ironworks Limited, Barrow-in-Furness. 1567

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division:—

STATION SUPERINTENDENT AND DEPUTY STATION SUPERINTENDENT, HIGH MARNHAM POWER STATION (Vacancy No. 218/57/ER).

Applications are invited for the positions of Station Superintendent and Deputy Station Superintendent at the High Marnham Power Station, which is now under construction. The ultimate capacity of this station will be 1,000 MW.

This power station is situated in a rural area on the River Trent, approximately 14 miles south of Gainsborough and 5 miles east of Tuxford, in the county of Nottinghamshire.

Candidates must have served a recognised engineering apprenticeship and have had wide experience in a responsible position in the administration, operation and maintenance of a modern high-pressure power station.

It is desirable that applicants should possess qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers.

The commencing salary for the Station Superintendent will be in accordance with Scale D, Grade 5 (£2,100-£2,300 per annum) of the National Joint Managerial and Higher Executive grades and the conditions of service will be those agreed by that committee.

The salary for the Deputy Station Superintendent will be in accordance with Class L, Grade 3 (£1,685-£1,790 per annum) of the National Joint Board Schedule, and the conditions of service for this post will be those agreed by the National Joint Board.

The closing date for the receipt of applications will be Monday, 21st December, 1957.

GENERAL ASSISTANT ENGINEER (Shift Control Duties), NORTHAMPTON POWER STATION (Vacancy No. 210/57/ER).

Applicants should have served an apprenticeship or had practical training suitable to the industry and should possess a sound general and technical education. Possession of an Ordinary National Certificate in Electrical Engineering is a minimum requirement.

Salary will be within the range (£540-£680 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th December, 1957.

SHIFT CHARGE ENGINEER, WARWICK POWER STATION (Vacancy No. 214/57/ER).

Applicants should be qualified engineers and should have had experience in the operation of steam turbine and boiler plant.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th December, 1957.

THIRD ASSISTANT ENGINEER (Electrical), GENERATION (Construction) DEPT. (Vacancy No. 215/57/ER).

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern power stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Class AX/EX, Grade 4 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th December, 1957.

STATION CHEMIST, BURTON-ON-TRENT POWER STATION (Vacancy No. 216/57/ER).

Previous experience in a power station laboratory is essential and candidates should hold the Higher National Certificate in Chemistry.

Applicants must be familiar with the sampling and analysis of coal, water and oil and the interpretation of the analytical results.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th December, 1957.

GENERAL ASSISTANT ENGINEERS, WILLINGTON, STAYTHORPE AND OTHER LARGE GENERATING STATIONS (Vacancy No. 220/57/ER).

Applications are invited from suitably qualified young men who are interested in generating station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern generating station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge and will be within the range £540-£730 per annum.

Closing date for receipt of applications, 1st January, 1958.

BOILER HOUSE SHIFT CHARGE ENGINEER, NORTH WILFORD POWER STATION, NOTTINGHAM (Vacancy No. 221/57/ER).

Applicants should have had a sound technical training, good general engineering experience, and a knowledge of the control and operation of large pulverised fuel boilers and associated equipment. Preference will be given to candidates who are in possession of technical qualifications admitting to Corporate Membership of a recognised professional institution.

Salary will be in accordance with Class K, Grade 9 (£995-£1,055 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1st January, 1958.

The appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

4th December, 1957. 1632

AUTOMATIC TELEPHONE AND ELECTRIC COMPANY LIMITED

SCHOOL OF ELECTRONICS

APPLICATIONS are invited for the following appointments in the School of Electronics of the Automatic Telephone and Electric Company Limited, Liverpool.

SENIOR LECTURER, One post.
LECTURER, Two posts.

The work is postgraduate in nature, and involves lecturing on modern electronic technique as applied to communication engineering.

Candidates should possess an honours degree in either:—

(a) Electrical engineering with electronics or telecommunications.
(b) Physics, with electronics and/or mathematics.

Salaries will be in accordance with the Burnham Technical Scale. Persons appointed will be required to join the company's superannuation scheme. Assistance can be given with housing in suitable cases.

Application forms and details may be obtained from:—

The Personnel Manager
AUTOMATIC TELEPHONE AND ELECTRIC CO. LTD.
Strowger Works, Liverpool, 7

1635

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

SECOND ASSISTANT ENGINEER (Industrial Sales and Development).

Applicants should have a general engineering background and be qualified to advise industrial consumers on extending the use of electricity. Practical experience in modern production methods and of heat treatment applications will be an advantage.

Salary N.J.B. Class L, Grade 7, £1,235/£30/£1,325 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Near Leeds, not later than 27th December, 1957.

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER (Construction).

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications, and must be fully experienced in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution network, substation plant and ancillary equipment.

Salary N.J.B. Class J, Grade 7, £1,065/£25/£1,140 per annum.

GRIMSBY DISTRICT
DISTRICT ENGINEER.

Candidates should be Corporate Members of the Institution of Electrical Engineers and should have a wide experience in the Electricity Supply Industry. The successful applicant will be responsible for all engineering work on the Board's distribution systems within the District.

Salary N.J.B. Class F, Grade 2, £1,235/£30/£1,325 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 27th December, 1957.

No. 3 (Sheffield) Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Rotherham District).

Applicants must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, with training and experience fitting them to take charge of substation, underground and overhead mains design, construction and maintenance work up to 11 kV, and system operation up to 66 kV in a heavy industrial and densely developed residential area surrounded by a rural area.

Salary N.J.B. Class J, Grade 7, £1,065/£25/£1,140 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 27th December, 1957.

No. 5 (Wakefield) Sub-Area

ENGINEERING DRAUGHTSMAN/SURVEYOR.

Applicants must be able to undertake the preparation of final or working drawings connected with the erection and equipment of substations and must have a sound knowledge of industrial and commercial building construction. They must have had experience in the use of surveying instruments and of site surveys.

Salary N.J.B. Schedule D, Grade 6, £595/£20/£715 per annum.

SENIOR DRAUGHTSMAN (Electrical).

Applicants should have had a good general and technical education to O.N.C. standard. Drawing office experience in electrical engineering design in a manufacturer's works for the electricity supply industry would be an advantage.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 12, Denby Dale Road, Wakefield, not later than 27th December, 1957. 1644

CLASSIFIED ADVERTISEMENTS ARE PREPAID

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Shropshire and Herefordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Leominster).

Duties involve the construction, maintenance and operation of E.H.V. and L.V. mains and substations and planning system reinforcements and mains extensions. Technical qualifications desirable. Salary £790/£835 per annum (N.J.B. Grade D.7). Superannuable.

FOURTH ASSISTANT ENGINEER (Telecommunications) (Headquarters).

The successful applicant will be responsible for the maintenance of V.H.F. radio and the internal telephone system including Pax equipment, and should have knowledge of supervisory equipment. Salary £685/£730 per annum (N.J.B. Grade H.13). Superannuable.

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

Worcester and District Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Worcester).

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £790/£835 per annum (N.J.B. Grade F.9). Superannuable.

Apply by letter, within fourteen days, stating age, experience, present salary and position to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Birmingham and District Sub-Area

FOURTH ASSISTANT ENGINEER and GENERAL ASSISTANT ENGINEER (Technical and Planning Section) (Headquarters).

To assist in the design of the H.V. and M.V. systems, analysis of loading conditions, preparation of specifications, layout of plant and equipment and technical investigations. Technical qualifications desirable. Salary, Fourth Assistant Engineer (N.J.B. Grades M.13/12), £885/£995 per annum. General Assistant Engineer (N.J.B. Grades M.18/14), £635/£880 per annum, according to qualifications and experience. Superannuable.

SECOND ASSISTANT DISTRICT ENGINEER (South East District).

Experience necessary in construction, operation and maintenance of H.V. and M.V. distribution systems. Technical qualifications desirable. Salary £995/£1,055 per annum (N.J.B. Grade H.7). Superannuable.

Apply by letter, within fourteen days, stating age, experience, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Wolverhampton and District Sub-Area

SECOND ASSISTANT ENGINEER (Commercial) (Headquarters).

Duties will include the development and coordination of electrical contracting and associated activities throughout the Sub-Area, and applicants should have had considerable experience in electrical contracting organisation and practice. Technical qualifications desirable. Salary £1,160/£1,235 per annum (N.J.B. Grade K.7). Superannuable.

Apply by letter, by not later than 31st December, 1957, stating age, qualifications, experience, present salary and position to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary.

1668

SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER required in District 344 (Merthyr) in the Central Sub-Area of the Board.

Salary Class F, Grade 7 (£885/£930) of the N.J.B. Agreement.

Applications, stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section,, St. Mellons, Cardiff, so as to reach him not later than Monday, 23rd December, 1957. 1606

NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (INDUSTRIAL DEVELOPMENT SECTION), CHIEF COMMERCIAL OFFICER'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER, 8.

Applicants should preferably have been trained and have experience in electrical engineering with particular reference to utilisation in industry. Preference will be given to applicants who hold H.N.C. in Electrical Engineering.

Salary scale £710 × £25 to £835-£935 p.a., Grade AX/EX 8. N.J.B. conditions.

Applications, naming three referees, to Assistant Secretary (Establishments), North Western Electricity Board, Cheetwood Road, Manchester, 8, by 21st December, 1957.

ENGINEERING DRAUGHTSMAN, SUB-AREA ENGINEER'S DEPT., BOLTON.

Applicants should have had a good technical training with drawing office experience in the layout of distribution network equipment, schematic and system diagrams.

Some knowledge of building construction would be an advantage.

Salary within range £595-£715 p.a., Schedule D, Grade 6. N.J.B. conditions.

SERVICE CENTRE SUPERVISOR (Male), RADCLIFFE.

Applicants should have experience in the sale of all types of domestic and commercial electrical equipment, the supervision of staff, stores and ordering procedure, display and correspondence.

The possession of the E.D.A. Salesmanship Diploma will be an advantage.

Salary scale £615 × £20 to £675 p.a., Grade 2. N.J.C. conditions.

SENIOR SALES REPRESENTATIVE (Male), BOLTON DISTRICT.

Duties include advising consumers, on their premises, on all matters normally concerned with sales development, i.e., tariff queries, and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Applicants should possess the E.D.A. Sales Certificate and preference will be given to those who have taken courses of study in electrical engineering.

Salary scale £615 × £20 to £675 p.a., Grade 2. N.J.C. conditions.

Applications for the above posts, naming three referees, to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, by 21st December, 1957. 1619

CITY AND COUNTY OF NEWCASTLE UPON TYNE

Appointment of Lighting Superintendent

APPLICATIONS are invited for the position of LIGHTING SUPERINTENDENT at a salary in accordance with the Joint Negotiating Committee Scale A (£1,145-£1,320).

Housing accommodation is not provided.

Candidates must be qualified lighting engineers with previous experience of public lighting, and must also be accustomed to the control of staff. Knowledge of the modern trend of public lighting and experience in the design and siting of new installations is essential.

The appointment will be subject to the provisions of the Local Government and other Officers' Superannuation Acts, 1937 and 1953; to the National Scheme of Conditions of Service, and to the successful applicant passing satisfactorily a medical examination.

Applications stating age and giving full details of qualifications and experience, present and previous positions held, together with the names of three persons to whom reference may be made, should be forwarded to the undersigned endorsed "Lighting Superintendent" not later than noon on Monday the 6th January, 1958.

Canvassing either directly or indirectly, will be a disqualification.

JOHN ATKINSON,
Town Clerk.

Town Hall,
Newcastle upon Tyne, 1.
6th December, 1957. 1649

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Department

Power Station Efficiency Engineer (Mechanical Engineer Grade 1)

APPLICATIONS are invited for the above-mentioned fixed establishment post in the Salisbury Municipality Electricity Undertaking on the salary scale £1,575 × £50 to £1,725 p.a. Commencing salary is at the minimum of the grade and no cost-of-living or other allowances are payable.

The successful candidate will be responsible as Efficiency Engineer to the Generation Engineer for the preparation, accuracy and correlation of all technical data required for the efficient control of the generating plant installed in the Salisbury Power Stations. He will also be responsible for the thermal or mechanical testing of plant in accordance with British Standards or standard practice.

The position calls for a knowledge of the theory of electrical, fluid and temperature measurement techniques as applied to thermal power station plant testing procedure and practical experience in the operation of electrical generating plant is essential.

Applicants should be Chartered Mechanical Engineers.

The appointment will be subject to the Council's service and leave regulations and the successful applicant will be required to furnish a satisfactory medical certificate of fitness. He must also be able to comply with the requirements of the immigration authorities.

Candidates are requested to submit full particulars of their qualifications, training and experience, which should include details of positions held and salaries received. Particulars of age, place of birth, nationality and marital state should also be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances towards travelling and removal expenses are obtainable from Davis & Soper Ltd., 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 20th December, 1957. 1506

ROLLS-ROYCE

Aero Engine Division

require

SHIFT CHARGE ENGINEERS

for operating electro-mechanical plant for altitude testing of aero gas turbine engines at Derby.

The installation comprises six 20,000-h.p. motor compressor sets, cooling and regeneration turbines, heat exchangers, refrigeration plant, cooling towers, electro-hydraulic and pneumatic control systems and ancillary services. The total installed h.p. is 150,000 with a supply voltage of 33,000 v.

Applicants should have had sound technical training and practical experience in the operation of this type of equipment. Appropriate technical qualifications would be an advantage.

The salary, which is progressive, commences at £1,085 per annum, plus shift allowances.

Applications will be treated in the strictest confidence and those selected for interview could be seen either in Derby or elsewhere as convenient.

Candidates should write for an application form to :—

The Manager
Technical Administration (CN)
Aero Division
ROLLS-ROYCE LIMITED
P.O. Box 31, Derby.

1513

***Situations Vacant** (continued)*

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Undertaking

Vacancy for Test Room Assistant (Meters)

APPLICATIONS are invited for the fixed establishment post of Technical Assistant Grade 2 in the Test Section of the above-mentioned undertaking. Salary scale is £1,100 × £50 to £1,250 p.a., commencing salary at the minimum. No cost-of-living or other allowances are payable.

Applicants must be thoroughly experienced in all types of meter testing, particularly high-tension, transformer-operated, polyphase equipments, both kW and kVA, and should be capable of carrying out all duties in connection with a standardising laboratory.

The main duties of this post are :—

(a) Testing and calibrating high-tension and special types of metering.
(b) Standardising instruments and sub-standard meters against potentiometer equipments.
(c) Ratio and phase angle testing of instrument transformers.
(d) Testing all types of instruments and meters, and general supervision of metering work.

The successful candidate must be able to comply with the requirements of the immigration authorities, and will be required to submit to the Council a satisfactory medical certificate of fitness.

Applicants should submit full particulars of their technical education, qualifications, if any, training and experience. Details of age, place of birth, nationality and marital state should be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances towards travelling and removal expenses, etc., are obtainable from Davis & Soper Limited, 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 27th December, 1957. 1507

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS

THE CIVIL SERVICE COMMISSIONERS invite applications for pensionable appointments covering a wide range of scientific research and development in most of the major fields of fundamental and applied science. In Biological subjects the number of vacancies is small : individual vacancies exist in the Natural History Museum for candidates who have special knowledge of, or who are interested in, taxonomic entomology, palæontology.

The Royal Naval Scientific Service require a Scientific Officer (male) for the National Institute of Oceanography to work on oceanic Cephalopoda ; and a vacancy for a Metallurgist (Scientific Officer) has arisen in the Royal Mint.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification, or be otherwise qualified by high professional attainments. Candidates for Senior Scientific Officer posts must also have had at least three years' postgraduate or other approved experience.

Age limits : Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted ; for Scientific Officers, between 21 and 28 during 1957 (up to 31 for permanent members of the Experimental Officer class).

Salary (London): Senior Scientific Officers, minimum £1,190 (women £1,098); men's scale maximum £1,410. Scientific Officers, minimum £635, men's scale maximum £1,110. Women's pay above £635 slightly lower but being raised to reach equality with men's in 1961. Somewhat lower rates in the Provinces. 5-day week, generally.

Further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S.53/57 for Senior Scientific Officers and S.52/57 for Scientific Officers.

Application forms should be returned by 31st December, 1957. 1643

NUCLEAR POWER STATION PROJECTS

A. REYROLLE & COMPANY LTD., as a member firm of the Nuclear Plant Company, in addition to being engaged on work for the C.E.A. Nuclear Power Station at Bradwell, is undertaking work in connection with a similar project in Italy. This is the first nuclear power station outside Britain to be engineered by British firms. To assist in undertaking this and other important nuclear power schemes qualified

ELECTRICAL
and
MECHANICAL ENGINEERS,
DESIGNERS
and
DRAUGHTSMEN

are required at the Hebburn offices of the company.

The work includes the preparation of special schemes and the design and development of electro-mechanical and mechanical equipment required for the control of nuclear reactors.

Applicants should possess a Degree, H.N. Diploma or H.N. Certificate, and should preferably have experience of mechanical and/or electrical design. Knowledge of the Italian language would be an advantage. Salaries will be appropriate to age, experience and qualifications. All appointments are pensionable and offer scope for advancement in this new and interesting field of power plant development. Assistance with house purchase can be arranged.

Applications, quoting NP/2, and stating full particulars, should be made to the Chief Engineer, A. Reyrolle & Company Ltd., Hebburn, Co. Durham. 1660

SERVICE MANAGER

required by the
DITCHBURN ORGANISATION
for their
MUSIC MAKER DIVISION
at Lytham, Lancs.

Essential qualifications include :—

1. Thorough knowledge of and practical experience in electrical and mechanical equipment such as phonograph and radio.
2. Actual management experience.

Duties and responsibilities will include :—

Control and distribution of all spare parts to branch factories and workshops.
Reconditioning and modification programme.
Preparation of service instructions and training of service personnel.

A certain amount of travelling will be involved in the United Kingdom and on the Continent.

This is a very important appointment. The salary will depend on qualifications and capability, but will be at least £1,000 p.a. There is a staff pension scheme and an opportunity to earn considerable bonuses. The Service Manager will be directly responsible to the General Manager.

Apply in writing, giving age and full details of qualifications and positions held to—

N. Lever, General Manager
DITCHBURN EQUIPMENT LTD.
Dock Road, Lytham, Lancs.

marking envelope " Service Manager, Private." 1600

BOROUGH POLYTECHNIC, Borough Road, London, S.E.1

Department of Electrical Engineering and Physics

A SENIOR TECHNICIAN, with knowledge of physics laboratory practice (or equivalent experience), is required to work in the Nuclear Instrumentation Research Laboratory. Some experience in assembly of electronic circuits would be an advantage.

Salary scale £490-£727 per annum. Starting salary dependent on qualifications and experience. 1605

CONTRACTS ENGINEERS

A. REYROLLE & COMPANY LTD., of Hebburn, County Durham, who are the largest firm of switchgear specialists in the world, have vacancies for CONTRACTS ENGINEERS both for home and overseas contract work on E.H.V. switchgear. In addition, vacancies also exist for CONTRACTS ENGINEERS to handle work in connection with major industrial installations and medium-voltage switchgear.

The appointment would be for work at Hebburn, and it is customary for the company to appoint engineers for duties in the overseas and home area offices from engineers trained at Hebburn.

The work requires initiative and affords the engineer individual responsibility. It is interesting and varied and calls for ability to conduct both technical and commercial negotiations. The desirable qualifications are therefore a Degree or a Higher National Diploma or Higher National Certificate, but candidates having Ordinary National Certificate who are still proceeding with studies could be considered specially. Applicants need not have specialised previously in switchgear, and if necessary suitable introductory training would be arranged.

Applications, giving full particulars of technical training and previous experience, should be forwarded to the Contracts Manager, A. Reyrolle & Co. Ltd., Hebburn, Co. Durham, marked " Personal." 1448

INSTRUCTION BOOK WRITER

'ENGLISH ELECTRIC'

STAFFORD

THE company wishes to appoint a Technical Writer interested in the compilation of operating procedures and installation and maintenance instructions associated with POWER SYSTEM METERING AND RELAY EQUIPMENT.

Applicants should have a sound technical background, preferably in the light current manufacturing or operating fields. They should also have a flair for written expression.

Applications, which will be treated confidentially, should contain details of age, qualifications, experience, present position and status.

Please write to the Central Personnel Services, 336/7, Strand, London, W.C.2, quoting Ref. ER.1292B.

357

LONDON TRANSFORMER DRAWING OFFICE

'ENGLISH ELECTRIC'

GOOD TRANSFORMER DRAUGHTSMEN
as well as
MECHANICAL DRAUGHTSMEN

are required for work on the heavier range of transformer manufactured by the company (30 MVA - 350 MVA).

These are permanent staff appointments carrying excellent salaries and offering opportunity for advancement within the Group to men who wish to progress.

This new office is pleasantly appointed in a modern office block 5 minutes from Victoria Station.

There are also attractive openings for JUNIOR DRAUGHTSMEN in this office.

We would also like to hear from Senior and Junior Draughtsmen interested in similar work at our STAFFORD works.

Please write giving full details to Central Personnel Services, 336/7, Strand, London, W.C.2, quoting Ref. ER.1299C.

1521

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

LUTON DISTRICT

FOURTH ASSISTANT ENGINEER (156/57.R).

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Salary N.J.B. Class H, Grade 11 (£790-£835).

Apply by letter, within fourteen days, to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, Beds.

Fens Sub-Area

THIRD ASSISTANT ENGINEER, Operation and Maintenance (157/57.R).

Applications are invited for the position of Third Assistant Engineer to operate in the Southern System based on Cambridge.

Candidates should have had a sound technical training and experience in the operation and maintenance of H.V. and L.V. overhead and underground systems, including substations, in urban and rural areas.

Salary N.J.B. Class J, Grade 9 (£935-£995).

FOURTH ASSISTANT ENGINEER, Operation and Maintenance (158/57.R).

Applications are invited for the position of Fourth Assistant Engineer to operate in the Northern System based on Peterborough.

Candidates should have had a sound technical training and experience in the operation and maintenance of H.V. and L.V. overhead and underground systems.

Salary N.J.B. Class J, Grade 13 (£740-£785).

For these appointments apply by letter, within fourteen days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge. 1653

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEERS required in the following districts:—

Liverpool Central, Salary £835/£880 p.a. (N.J.B. J/11).

Liverpool North and Liverpool South, Salary £790/£835 p.a. (N.J.B. H/11).

Duties include estimating for contracting work, and advising consumers on electricity supply matters and on normal applications of electricity.

Applicants should preferably have at least the Ordinary National Certificate in Electrical Engineering or equivalent qualification.

Appointments subject to medical examination. Pension scheme.

Standard application forms to be forwarded to the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3. Closing date 26th December, 1957.

Applications received in response to the previous advertisement for this vacancy are still under consideration. 1651

CITY OF BIRMINGHAM EDUCATION COMMITTEE

Garretts Green Technical College, Garretts Green Lane, Birmingham, 33

Principal: B. C. Whitehouse, B.Sc., A.R.I.C.

APPLICATIONS are invited for the following full-time teaching post: ASSISTANT, GRADE B, to teach subjects of O.N.C. Electrical Engineering and C. and G. Electrical Installation Courses. H.N.C. or equivalent qualification required.

Salary scale: Assistant, Grade B, £650 × £25 to £1,025.

In all cases when assessing the initial salary, increments may be allowed for appropriate experience in industry or commerce, in addition to increments for training and degree or degree equivalent.

Application forms and further particulars available from the Principal (foolscap s.a.e.), to whom completed forms should be returned as soon as possible.

E. L. RUSSELL,
Chief Education Officer.
1630

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

Third Assistant Engineer, Steam Testing Department, Dunston-on-Tyne

APPLICATIONS are invited for the appointment of a THIRD ASSISTANT ENGINEER for test work principally in the nature of thermodynamic investigations, on boiler and turbine plant in the power stations within the North Eastern Division.

Technical qualifications leading to associate membership of a recognised institution are required and some experience of plant operation would be an advantage.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 6 (£895-£1,110) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 30th December, 1957. 1655

HOME OFFICE: WIRELESS TECHNICIAN

THE CIVIL SERVICE COMMISSIONERS invite applications from men for about 50 permanent posts in Pinner, Middx., and at Regional Wireless Depots in various parts of England and Wales. Duties include installation and maintenance of radio equipment used by police and fire services. Age at least 22 on 1st December, 1957.

Candidates must have sound theoretical and practical knowledge of wireless engineering and communications equipment, including V.H.F. apparatus. Possession of C. and G. Certificates, or comparable qualifications, an advantage. Ability to drive a car desirable.

Starting pay at Pinner £540 at age 24 (£30 less for each year under 24) up to £630 at age 28. Scale maximum £685. Slightly less at Regional Depots. Promotion prospects. 5-day week.

Further particulars and application form from Secretary, Civil Service Commission, Trinidad House, Old Burlington Street, London, W.1, quoting No. S4792/58. Completed application forms to be returned by 6th February, 1958. 1620

COUNTY COUNCIL OF NORTHUMBERLAND

County Architect's Department

ASSISTANT ELECTRICAL ENGINEER required on the permanent staff of the County Architect's Department. Salary scales to be in accordance with qualifications and experience.

Candidates must be capable of preparing installation drawings for schools or other buildings usually carried out by a County Council; supervision of work will be given should any applicants who wish to apply feel they are not fully experienced.

Applications giving full details of age, education, qualifications and previous experience together with the names of two referees to whom reference can be made should be forwarded to the County Architect, County Hall, Newcastle upon Tyne, 1, within fourteen days of the publication of this advertisement.

The appointment will be subject to the provision of the Local Government Superannuation Acts and the successful candidate will be required to pass a medical examination. 1650

ELECTRICAL DRAUGHTSMEN

DAVY AND UNITED ENGINEERING CO. LTD. have vacancies for ELECTRICAL ENGINEERING DRAUGHTSMEN.

Applicants should preferably be studying or have obtained the H.N.C. or O.N.C. Experience in a steelworks or with an electrical manufacturer and knowledge of switchgear and fault finding would be an advantage but is not essential.

Apply with details of age, qualifications and experience to Personnel Department, Davy and United Engineering Co. Ltd., Prince of Wales Road, Sheffield, 9. 1601

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

General Assistant District Engineer, Ardrossan District

APPLICATIONS are invited for the above superannuable appointment from candidates who are in possession of a National Certificate in Electrical Engineering and have had experience on distribution systems up to and including 33 kV.

The salary will be within Class F, Grade 11 of the N.J.B. Agreement (£685/£730 p.a.).

Applications on the standard form, obtainable from any Area Manager, should be received by 20th December, 1957.

A. E. ROOTS,
Greenholm Street, Manager.
Kilmarnock. 1607

MIDDLESEX COUNTY COUNCIL

ASSISTANT ELECTRICAL ENGINEER required in County Engineer's Dept., Entertainments Licensing Section, at Hendon Central. A.P.T. II (£696 rising to £725 p.a. at 1/4/58 and then to £845 p.a. plus London weighting according to age). Established, pensionable, subject to medical assessment. Prescribed conditions. Should be over 25 years, have received good general education, and preferably hold Higher National Certificate in Electrical Engineering, or equivalent examination. Experience of electrical installation work of large buildings essential. Required to carry out certain inspection duties outside office hours, for which additional £110 p.a. paid. Motor car required, allowance considered.

Apply to County Engineer, 10, Great George Street, London, S.W.1, by 28th December, 1957 (quote W.573ER). Canvassing disqualifies. 1598

INSPECTOR (ELECTRICAL)

required by the GOVERNMENT OF TANGANYIKA for Public Works Department on contract for tour of 30 to 36 months in first instance. Salary scale (including inducement pay) £1,056 rising to £1,341 a year. Gratuity at rate of 13⅓% of total substantive salary drawn. Outfit allowance £45. Free passages. Liberal leave on full salary.

Candidates must have served full apprenticeship and passed O.N.C. They must have at least five years' subsequent experience as journeyman, be fully conversant with I.E.E. regulations relating to public buildings and factories, and have good experience of repair and overhaul of electric motors, dynamos and switchgear.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42530/EF. 1613

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required in the Liverpool South District. Salary within range £995/£1,055 per annum (N.J.B. Class H, Grade 7).

Applicants should have had experience in the construction, operation and maintenance of systems up to and including 33 kV, and should possess suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Special forms of application may be obtained from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, and should be returned to him not later than 23rd December, 1957. 1604

Applications are invited by

THE BENJAMIN ELECTRIC LTD.

for a

DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17.

177

***Situations Vacant** (continued)*

SOUTHERN ELECTRICITY BOARD

Demonstrator

WEYMOUTH District of No. 4 (Bournemouth) Sub-Area. Salary N.J.C. Grade 1 (£500 × £20 to £600 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus, and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent domestic science qualification would be an advantage.

The successful candidate will be required to contribute to the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed not later than 30th December. 1957. 1642

CENTRAL ELECTRICITY AUTHORITY

Southern Division

FOURTH ASSISTANT ENGINEER. SWINDON REGION TECHNICAL DEPARTMENT (S/13.966).

Applicants should have experience of electrical engineering in relation to protective gear including testing, and knowledge of modern switchgear practice is desirable. Applicants should possess H.N.C. or equivalent, and preference will be given to those who hold or are studying for membership of a recognised professional institution.

Salary N.J.B. Class ZX/CX, Grade 7, £810-£985 or Grade 8, £710-£885.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary. Central Electricity House, High Street, Portsmouth, should be returned by 1st January, 1958. 1654

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the Meaford Section of the Transmission Department located at Meaford. near Stone. N.J.B. Service Conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing in the range £710-£835 and ultimately rising to £935 per annum.

Applicants should possess Higher National Certificate in Electrical Engineering or an equivalent qualification and should have had some experience in the operation and maintenance of high voltage transmission lines and substations.

Apply quoting vacancy number 706MD, on form AE6 available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 31st December, 1957. 1656

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Hams Hall B Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K10, £935-£995 per annum, plus 10% of basic salary for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply quoting Vacancy No. 704MD, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 30th December, 1957. 1657

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

LONDON ELECTRICITY BOARD

Demonstrator (Female)

APPLICATIONS are invited for the above position in the Board's Southern District, based at Brixton, London, S.W.9.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including electrical housecraft, and having experience in conducting demonstrations at service centres and in general service centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the service centre and on consumers' premises.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £525/£640 per annum, inclusive of London Area allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 21st December, 1957. Please quote ref. PER/2393/R. 1610

NATIONAL COAL BOARD

ELECTRICAL ENGINEER required at the N.C.B.'s Central Engineering Establishment, Stanhope Bretby, near Burton-on-Trent, as Section Head responsible to the Chief Development Engineer for supervising and guiding a team of specialist and general engineers engaged on the design and development of electrical equipment for the mining industry.

Wide experience of development engineering work and particularly the technical direction of outside contractors is essential; experience in power engineering as well as light current engineering is desirable. Sound technical and practical training and academic qualifications are required.

Appointment (superannuable) according to qualifications and experience within range £1,550 - £2,150.

Write for application form to N.C.B. Staff Dept. (X999F), Hobart House, London, S.W.1, before 20th December, 1957. 1599

MID-WORCESTERSHIRE HOSPITAL MANAGEMENT COMMITTEE

Group Engineer's Department

APPLICATIONS are invited for the appointment of TECHNICAL ASSISTANT to assist on site surveys, preparation of plans, specifications and estimates for engineering and buildings maintenance generally.

Applicants should be preferably between 23 and 28 years of age and have O.N.C. or H.N.C. in Electrical or Mechanical Engineering or equivalent qualification.

Salary at age 23 years £445 per annum rising to a maximum of £615 per annum.

Applications stating qualifications, age and experience and names of three referees should reach the undersigned by 6th January, 1958.

C. M. SMITH,
Group Secretary.
Birmingham Road,
Bromsgrove. 1652

ELECTRIC MOTOR SALES

REPRESENTATIVES required by outstandingly progressive company for sales of motors from fractional to 600 h.p.

Best possible prospects, incentives and conditions for top grade men.

Applications to:—

The Managing Director,
NEWMAN INDUSTRIES LIMITED,
Yate, Bristol.

1568

A.C. MOTOR DESIGNER

required by

MAVOR & COULSON LTD.

with experience on the design of totally enclosed machines up to 3,300 volts.

Applicants must be conversant with automatic control gear; knowledge of flameproof enclosures an advantage but not essential.

Sports and social activities; pension scheme and good working conditions.

State age, qualifications and experience, by letter, to Personnel Manager, Mavor & Coulson Ltd., 47, Redan St., Glasgow, S.E. 1661

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT (Expenditure and Stores), Croydon and Purley District. Salary £992 to £1,070 per annum (including London Area allowance) under N.J.C. Grade 6. Superannuable.

Candidates should be good organisers, suitably qualified, have a wide experience of district office work, and be able to take charge, under the District Chief Clerk, of expenditure, wages, stores and the clerical functions of the contracting department for a large district of 130,000 consumers.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 30th December, 1957.

A. L. BURNELL,
Secretary. 1646

CENTRAL ELECTRICITY AUTHORITY

South Western Division

SECOND ASSISTANT STATION CHEMIST required at Portishead A and B Power stations.

Superannuation scheme. Salary N.J.B. Class L, Grade 11, £935 × £20 to £995.

Candidates must have had training up to Higher National Certificate level in Chemistry and experience in water and fuel analysis together with water treatment as applied to power station operation.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 20th December, 1957. 1658

ELECTRICAL/ELECTRONIC ENGINEER

required at the

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

to operate and maintain a nuclear physics machine consisting of 28 MeV electron accelerator used to bombard uranium and so to produce intense neutron pulses for nuclear experiments.

Applicants should have a professional qualification. An Electrical Engineering Degree and experience of high vacuum or high frequency techniques, or of electro-mechanical plant, is desirable. Salary £815 (at 25) to £1,270.

Housing, superannuation and excellent conditions.

Send POSTCARD to Recruitment Officer (902Y/48), A.E.R.E., Didcot, Berks. 1659

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required at Llandudno Junction. Salary £835/£880 per annum (N.J.B. E.7).

Applicants should have had experience in the construction and operation of overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

The appointment is subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham.

Closing date 20th December, 1957. 1621

UNIVERSITY OF BELFAST

APPLICATIONS are invited for a LECTURESHIP IN ELECTRICAL ENGINEERING (Heavy). Salary range £900 × £50 to £1,300, and on certain conditions being fulfilled to £1,650, plus contributory pension rights under the F.S.S.U. Initial placing on the scale £900 to £1,650 to depend on experience and qualifications.

Applications should be received by 22nd January, 1958. Further particulars may be obtained from the Secretary, The Queen's University of Belfast, Northern Ireland. 1636

LARGE BELGIAN COMPANY

requires for their planning offices in Brussels an

ELECTRICAL ENGINEER

with university diploma, specialising in very high tension (substation and transmission lines). Knowledge of French desirable.

Please write with curriculum vitæ—"G. E.," Office de Publicité, 16, rue Marcq, Brussels, Belgium. 1667

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

South Caledonia Area

APPLICATIONS are invited for the post of ASSISTANT ENGINEER (Contracts and Stores) in the Distribution Department of the Area Office at Perth.

Applicants should preferably have had experience in the preparation and checking of contract documents, and in site meetings with contractors. The conditions of employment will be those laid down by the National Joint Board for the electricity supply industry, and the commencing salary will be G.7, £935-£995.

Application forms, which can be obtained from the Board's Office, should be completed and returned to the Area Manager, South Caledonia Area, Blackfriars, Perth, within 14 days of the date of this advertisement. 1648

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

A FOURTH ASSISTANT ENGINEER is required in the Tele-Communications Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing in range £710 to £835, ultimately rising to £935 per annum.

Preference will be given to candidates who have had experience with tele-communications equipment, and the possession of a qualification equivalent to the Higher National Certificate in Electrical Engineering would be an advantage.

Apply quoting Vacancy No. 695MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 31st December, 1957. 1560

A.C. MOTOR DESIGNER

required by

MAVOR & COULSON LTD.

with experience on the design of totally enclosed machines up to 3,300 volts. Applicants must be conversant with automatic control gear; knowledge of flameproof enclosures an advantage but not essential.

Sports and social activities; pension scheme and good working conditions.

State age, qualifications and experience by letter to the

Personnel Manager

MAVOR & COULSON LTD.

47, Redan Street, Glasgow, S.E.

1532

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER is required at Meaford "A" Power Station, near Stone, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.7, £935-£995 per annum plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Knowledge of pulverised fuel firing would be an advantage. Appropriate qualifications desirable.

Apply, quoting Vacancy No. 699MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 31st December, 1957. 1633

NORTH EASTERN ELECTRICITY BOARD

York Sub-Area

APPLICATIONS are invited for the appointment of THIRD ASSISTANT DISTRICT ENGINEER, York District.

Applicants should preferably have had experience on E.H.V. and H.V. networks supplying urban and rural areas and in supervision of direct labour and contractors on construction work. Salary Schedule A, Class F, Grade 9, £790/£835. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 1647

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

Operating and Efficiency Engineer, North Tees "C" Power Station

APPLICATIONS are invited for the appointment of OPERATING & EFFICIENCY ENGINEER at North Tees "C" Power Station, Billingham.

Applicants should have had a wide experience in the operation, maintenance and administration of power stations.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule A, Grade 5, Class J (£1,235-£1,325 per annum).

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 27th December, 1957. 1622

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

ENGINEERING DRAUGHTSMAN (Junior) required in the Transmission Department, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule D, Grade 6, £595-£715 per annum.

Applicants should have had a good general and technical education, and experience in the preparation of layout plans, electrical diagrams and engineering drawings, preferably associated with high-voltage substations and for overhead transmission lines.

Apply, quoting Vacancy No. 698, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 2nd January, 1958. 1634

CENTRAL ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 182/ER/57

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER, TIR JOHN POWER STATION, PORT TENNANT, SWANSEA.

Salary H.9, £885 × £15 to £930 per annum.

H.N.C. or equivalent qualifications and regular apprenticeship desirable. Experience in operation of modern generating plant essential.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 24th December, 1957. 1631

SURREY EDUCATION COMMITTEE

Richmond Institute of Further Education, Kew Road, Richmond

APPLICATIONS are invited from men with practical and, if possible, teaching experience for a full-time appointment from 1st March, 1958, to help with the City and Guilds ELECTRICAL INSTALLATION classes to part-time day-release students.

Salary Grade A, £475 × £25 to £900 p.a. plus London allowance; Grade B scale (£650 × £25 to £1,025) might be offered to a well-qualified man. Approved industrial experience will be taken into account in fixing commencing salary.

Application forms obtainable from the Principal, to whom they should be returned by the 31st December, 1957. 1623

ELECTRICAL LAYOUT DRAUGHTSMAN

required for drawing office of light engineering works on Blantyre Industrial Estate. Five-day week. Canteen facilities.

Please apply in writing to ref. JM/59, The Belmos Company Limited, Bellshill, Lanarkshire. 1609

ELECTRICAL DESIGNER

EXPERIENCED ELECTRICAL DESIGNER required for Dublin consultants' office. Practical site experience desirable.—Box 1662.

LANCASHIRE DYNAMO & CRYPTO LTD.

Trafford Park, Manchester, 17

require the undermentioned additional staff:—

TECHNICAL ASSISTANTS for Service Dept. Applicants should have good technical background (preferably H.N.C. standard), be conversant with electrical rotating machinery, and able to handle correspondence.

5-day week. Pension scheme.

Applications will be treated with the strictest confidence and should be addressed to the Personnel Manager. 1509

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in District 463/4 (Chepstow) in the Eastern Sub-Area of the Board.

Salary Class D, Grade 7 (£790/£835) of the N.J.B. Agreement.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 30th December, 1957. 1645

A TECHNICAL sales representative for Yeovil and West Country. Generous salary/commission/expenses. Must own car. Pension scheme, 5½-day week. Only applicants with experience, initiative and dynamic personality will be considered. Full details to—Man. Dir., British Central Electrical Co. Ltd., 6, Rosebery Avenue, London, E.C.1. 1499

AN electrical engineer is required for a junior post concerned with the design and development of electro-mechanical equipment for railway signalling and traffic control systems. Qualifications: Graduate or H.N.C. in Electrical Engineering or C. and G. Telecommunications Certificates. Those studying for the foregoing qualifications will be considered. Day release may be granted in special cases. 5-day week and pension scheme. Apply in writing, giving age, qualifications and previous experience, to the Personnel Superintendent, Westinghouse Brake & Signal Co. Ltd., Chippenham, Wilts, quoting ref. EED/1/ER. 1483

AN electronic engineer required by well-known instrument company in London. B.Sc. in Electrical Engineering essential. Age 22-28; to work on transistor circuit development for very interesting industrial applications. Salary £750/£850.—Box 1482.

APPLICATIONS are invited for position of technical assistant contract engineer with large electric cable contracting company. Applicants should have minimum qualification of O.N.C. in Electrical Engineering. Duties comprise compiling detailed schemes for electrical transmission and distribution. Ample scope for promotion. Pension fund and other privileges.—Box 1523.

ASSISTANT electrical engineer required by steel tube manufacturers in Birmingham, to be responsible for all electrical maintenance and repairs, including a large number of overhead cranes and other lifting appliances, total load 7,000 kVA. Applicants must be between the age of 24 and 30, have a university degree or equivalent, and have served a recognised apprenticeship or training for at least 3 years in electrical engineering. Contributory pension scheme. Apply, stating age, qualifications, experience and salary required to—Personnel Manager, Tubes Limited, Aston, Birmingham, 6. 1579

ASSISTANT engineers required by London contractor for work on site. Experienced in cable laying and jointing. C.M.A. training and possession of O.N.C. advantageous. Pension scheme. Salary in accordance with experience and qualifications.—Box 1625.

ASSISTANT manager required by well-known electrical organisation in Glasgow for their contracting department; age 25/30. Applicant should have experience in the supervision of large contracts; some estimating experience an advantage; preference given to one with Higher National Certificate or similar technical qualifications. The department offers exceptional opportunities of expansion. Apply stating age, qualifications and experience to—Box 1664.

CABLE jointer wanted. Used to H.T. and L.T. jointing. Also must have experience of general installation.—Box 1357.

***Situations Vacant** (continued)*

ASSISTANT power station superintendent required by industrial power company in Malaya for 50-MW thermal station. Applicants must have had a sound technical training and experience in power station operation and maintenance, with at least two years as shift charge engineer. Commencing salary according to qualifications and experience within the scale £1,190/£56/£1,526 p.a. plus allowances from £105 p.a. for single man to £609 p.a. for married with two children. First class passages. Three-year tours followed by six months' home leave. Pensionable appointment. Free furnished quarters. Write Box ER.776, c/o 191, Gresham House, London, E.C.2. 1611

CIRCUIT and layout draughtsman required for automatic control gear associated with multi-motored machine tools. Knowledge of the application of transductors and electronic equipment desirable. A.S.D.E. rates of pay; bonus; five-day week; canteen facilities. Apply in first instance in writing to The Newall Engineering Co. Ltd., Peterborough, giving full details of past experience and particulars of any qualifications held. 1612

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CONTRACTS engineers for London and Midlands. Must be experienced in estimating and installation of all types of electrical equipment and associated cabling and jointing. Training with C.M.A. or Electricity Boards advantageous. Pension scheme. Salary £850-£1,000 p.a., dependent on experience and qualifications.—Box 1624.

DESIGNER draughtsman, leading firm of contractors London, has a senior appointment of wide scope and interest available to a first-class engineer able to design (and supervise site work) high-class electrical installations of all types. Good junior also required. Excellent prospects and salary. Write, experience, age and salary envisaged.—Box 1203.

DESIGNER-draughtsman required, experienced in L.T. switchgear layout and fabrication of sheet steel control panels. Knowledge of power and control circuits required. Permanent position, pension scheme. State salary required. Apply Chief Engineer, Astral Switchgear Ltd., Alma Rd., Enfield, Middlesex. 1540

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer. Dewhurst & Partner Ltd., Inverness Works. Inverness Road. Hounslow, Middlesex. 274

ELECTRICAL contracting firm in Edinburgh, of good standing, has vacancy for a technical assistant. Excellent progressive post for qualified electrical installation engineer, who should preferably be between the age of 25-35 and have qualification comparable to Higher National standard. Salary £750-£1,250 per annum, with pension scheme and allowances. Apply giving full particulars of qualifications and experience in confidence to—Box 1663.

ELECTRICAL contractor (London) has vacancy for estimator used to large contracts, capable of handling them from enquiry to completion. Exceptional opportunity for experienced man able to accept responsibility. Applications will be treated confidentially. State age, salary, with concise particulars of experience.—Box 1584.

ELECTRICAL engineer required by Engineering Service Installations Ltd., 258, Gray's Inn Rd., London, W.C.1. Experienced in design, preparing specifications and estimating for all types of electrical installations. Canteen facilities, superannuation scheme. Please write giving details of experience and salary required, marked "Confidential," to—Manager, Electrical Department. 1602

ELECTRICAL engineering assistant required with experience in lift practice. Salary up to £860 p.a. Pensionable. Application form from Chief Engineer (57/62), L.C.C., County Hall, London, S.E.1. (2256) 1637

ELECTRICAL installations engineer required. Knowledge of lift and transmission lines also necessary. Good opportunity energetic man. Tours 18-21 months.—Utilities (W.A.) Ltd., P.O. Box 183, Ebute Metta, Lagos, Nigeria. 9218

ELECTRICAL sales engineer having experience in motor control gear required for London office area. Vacancy offers good salary and is pensionable. Write stating age, experience, etc., to—London Manager, Igranic Electric Co. Ltd., Victoria Station House, Victoria Street, London, S.W.1. 1459

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

JUNIOR electrical engineer/draughtsman. Age 22/25, H.N.C. or O.N.C., experienced in estimating and contract work for mechanical handling plant. Pension fund. Sports and canteen facilities. Particulars of experience, qualifications and salary to—W. J. Jenkins & Co. Ltd., Retford, Notts. 1501

JUNIOR estimator wanted by prominent electrical contractors in London. Must have served apprenticeship. Progressive position for ambitious man. Write in confidence, experience, age and salary required.—Box 1583.

LAMP factories in London have vacancies for technicians working with incandescent lamps and filaments. Applicants must be over 18 years of age with suitable experience or able to undertake further training. Apply, quoting ref. LED/WJM, to—Atlas Lighting Ltd., Angel Factory Colony Estate, Edmonton, London, N.18. 1550

LEADING London firm heating, ventilating and air conditioning engineering contractors require electrical engineer experienced in circuit design and automatic controls. Age 25/30 years preferred. Write—Box 759, Sells Ltd., Brettenham House, Strand, London, W.C.2. 1615

LONDON consulting engineers require electrical engineers for installation design for hospitals, commercial buildings, schools, etc. Write stating age, qualifications, experience and salary required to—Box 160.

PRODUCTION manager required for large electric lamp manufacturing concern in North London. Applications invited from candidates who have experience in manufacturing of GLS and miniature lamps on high-speed units. Excellent prospects for right man. Good salary, 3 weeks' holiday, superannuation scheme. —Box 1603.

SALES assistant to director of firm of cable reel manufacturers; must be young, of smart appearance and preferably with experience of electric cable trade. All applications will be treated in confidence. Apply to—W. Hakesley, Heathfield & Co. Ltd., Trading Estate, Slough, Bucks. 1585

SENIOR cable sales representative required for Manchester area. Applicants should possess a sound education and previous experience in the thermoplastic cable trade. All applications will be regarded as confidential. Full details to Managing Director, Permanoid Ltd., New Islington, Manchester, 4. 1543

SENIOR electrical tester required. Some previous experience of motor and alternator testing essential. Ordinary National Certificate desirable. Staff pension scheme. Please apply to—Personnel Manager, Small Electric Motors Ltd., Churchfields Rd., Beckenham, Kent. 1616

TECHNICAL assistant for sales office engaged in tendering and executing contracts for transmission line insulation. Qualifications: Higher National Certificate preferable, and previous tendering experience and ability to handle correspondence would be considered an advantage. Replies stating age, qualifications and experience should be addressed to the Personnel Officer (Staff), Pilkington Brothers Limited, St. Helens, Lancashire. 1614

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TECHNICAL assistant to managing director of small firm mfg. elec. components London, N.7. Must be versatile and able to control staff. Min. quals. O.N.C. in elec. eng. Excellent opportunity for young ambitious man. Write stating age, experience, qualifications and salary expected to—Box 1638.

TECHNICAL assistant with conrtacting experience required by nationally known company for the estimating and measuring department of their offices in Glasgow. Higher National Certificate or equivalent qualifications essential. Applicant will have the opportunity of estimating, measuring and designing large modern electrical installations for nuclear power stations with electronic controls. Splendid opportunity of advancement. Apply stating age, qualifications and experience to—Box 1665.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

CABLE jointer experienced in voltages up to 22 kV desires position abroad. Willing to go immediately. Excellent references.—Box 9211.

ELECTRICAL contractor's London manager (35) seeks change, managerial or executive post with reputable company. Available February or March. All enquiries answered. Please reply—Box 9215.

ELECTRICAL site engineer/agent, age 39, extensive installation experience, capable, energetic, seeking new situation, home near London.—Box 9208.

HAVE you a sales representative position to offer an electrical engineer (27) resident London area? Served apprenticeship, experienced in light engineering field, no qualifications, conscientious, adaptable. Please write fully. All letters answered.—Box 9217.

ARTICLES FOR SALE

LIGHT WEIGHT ALTERNATORS FOR PORTABLE GENERATING SETS

100 unused 4-kVA, 230-volt, single-phase, 100-cycle Alternators, 3,000 r.p.m., self-exciting with automatic voltage regulators. Immediate delivery with guarantee.

Alternators only - - Price £30.
Alternators with A.V.R.s Price £45.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 1530

GENERATORS

100 unused 30-kW, 225-volt D.C. Generators by MAWDSLEY, compound wound, 960 and 1,440 r.p.m., class 2, continuously rated, cowl ventilated.

First-class condition.
Immediate delivery covered by guarantee.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 1529

ELECTRICAL EQUIPMENT FOR SALE

1500-h.p. B.T.H. Rolling Mill Motor, 3,300/3/50, 211 r.p.m.
1070-h.p. BRUCE PEEBLES ditto, 3,300/3/50, 495 r.p.m.
750-h.p. BROWN BOVERI ditto, 2,200/3/50, 146 r.p.m.
2500-h.p. Reduction Gear, ratio 5.3 to 1.

F. BURRILL & CO.
235a, Cathedral Road, Cardiff
(Tel. 26100) 1487

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

DIESEL ALTERNATOR SETS

400/440 volts, 3-phase, 50 cycles

500-kVA PETTER "SS" vertical 6-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

250-kVA PETTER "SS" vertical 3-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

187-kVA WAUKESHA vertical 6-cyl. radiator cooled Engine. Eng. start. G.E.C. Alternator. Control gear. 1,000 r.p.m.

162.5-kVA CROSSLEY vertical 6-cyl. water cooled Engine. Comp. air start. L.D.C. Alternator, control gear. 500 r.p.m.

149-kVA RUSTON vertical 5-cyl. water cooled Engine. Comp. air start. L.D.C. Alternator, control gear. 600 r.p.m.

125-kVA NATIONAL vertical 6-cyl. radiator cooled engine. Comp. air start. BRUSH Alternator, control gear. 1,000 r.p.m.

100-kVA MIRRLEES vertical 3-cyl. water cooled Engine. Comp. air start. G.E.C. Alternator, control gear. 600 r.p.m.

93.5-kVA BLACKSTONE vertical 3-cyl. water cooled Engine. Comp. air start. E.C.C. Alternator, control gear. 600 r.p.m.

68.8-kVA CROSSLEY vertical 6-cyl. water cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear. 1,000 r.p.m.

62.5-kVA McLAREN vertical 5-cyl. radiator cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear. 1,000 r.p.m.

62.5-kVA PERKINS vertical 6-cyl. radiator cooled Engine. Elec. start. METRO-VICK Alternator, control gear. 1,500 r.p.m.

58-kVA FOWLER vertical 6-cyl. radiator cooled engine. Elec. start. L.D.C. Alternator, control gear. 1,500 r.p.m.

37-kVA PERKINS vertical 6-cyl. radiator cooled Engine. Elec. start. HIGGS Alternator, control gear. 1,500 r.p.m.

27-kVA CROSSLEY vertical 3-cyl. radiator cooled engine. Hand start. CROM-PARK. Alternator, control gear. 1,000 r.p.m.

20-kVA LISTER vertical 3-cyl. radiator cooled Engine. Hand start. CROM-PARK. Alternator, control gear. 1,000 r.p.m.

14-kVA NATIONAL vertical 2-cyl. radiator cooled Engine. Hand start. B.T.H. Alternator, control gear. 1,000 r.p.m.

THOS. W. WARD LTD.
Albion Works, Sheffield
(Phone 26311, ext. 347; Grams, Forward).
322

WELDING PLANT

NEW OXFORD oil-cooled transformer-type Arc Welders for operation on 400/440/1/50; dual voltage output; current variable 20/300 amps.

£85 each ex works.

Immediate delivery.

Similar units available for lower current ratings and for special applications.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 1528

ALTERNATORS IN STOCK

All suitable for 3-phase, 50 cycles, 400-440 v.

500-kVA, 600-rev. CROM. PARK., 3-bearing.
329-kVA, 1,000-rev. ENG. ELEC., single-brng.
312½-kVA, 600-rev. CROM. PARK., 3-bearing.
170-kVA, 1,000-rev. BRUSH, 4-bearing.
150-kVA, 750-rev. CROM. PARK., 2-bearing.
120-kVA, 750-rev. ENG. ELEC., 3-bearing.
57½-kVA, 1,500-rev., 2-bearing.
22½-kVA, 1,500-rev. CROM. PARK.

THOMAS MITCHELL & SONS LIMITED
Bolton
1437

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, 1 set of 8 combined heating and cooling platens by Metropolitan-Vickers Electrical Co. Limited, 400 volts, 3-phase, high temperature 400 C. (752° F.), complete with contactors, etc. — Ashdowns Ltd., Eccleston Works, St. Helens, Lancs. 1626

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ¼ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

OVERHEAD line plant. One Starloc 100-ton chassis-mounted hydraulic jointing compressor, completely overhauled by makers. Now in "as new" condition. Available inspection London area.—Box 1411.

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes: enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TIME switches from stock. Reconditioned or new. 12 months' guarantee. Lists from—J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tel. HOP 2759). 178

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

***Articles Wanted** (continued)*

BRADLEY Redundant Electrical, 74, Eversleigh Rd., London, E.6 (Phone GRA. 2750). London leading clearing house for all redundant electrical stock and equipment, A.C. and D.C. motors, generating plants, welders and diesel sets. Complete factories bought and dismantled if required, also small or large stocks of scrap cable (dismantled if required). Estimates given. 185

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

SURPLUS stocks of all types of domestic electric appliances wanted for prompt cash. Large funds available.—Spears, 14, Watling St., Shudehill, Manchester (Phone, Blackfriars 1916) (Bankers, Midland Bank Ltd.). 338

WANTED, balancing machine for armatures and rotors.—Box 1666.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED, diesel engines and diesel sets.—H. Murfet, Daleside Rd., Nottingham. 240

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

FREE lance designer lighting fittings would be interested to hear from manufacturers, etc. London/Home Counties.—Box 9216.

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications. Write—Dept. 'S,' Philpott's Metal Works Ltd., Chapman Street, Loughborough. 211

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

AGENCIES

AGENT (commission only) with established connection among electrical wholesalers in London area required by small manufacturer with limited range conduit fittings. Apply—George Hughes (Cobo) Ltd., 25, Scott Street, Birmingham, 7. 1628

AGENT (commission only) with established connection among electrical wholesalers on South Coast required by small manufacturer with limited range conduit fittings. Apply—George Hughes (Cobo) Ltd., 25, Scott Street, Birmingham, 7. 1627

REPUTABLE manufacturers' agent with a staff and office central Leeds and good commercial and industrial connection North-East England is able to undertake sales representation on behalf of one further reputable concern.—Box 1617.

BUSINESS OPPORTUNITIES

MANUFACTURERS of quality fluorescent fittings, tubes, starters and control gear wish to contact quantity buyers, wholesalers, agents, etc., interested in purchasing in quantity at special low prices. Advertisers are interested in long or short term arrangements.—Box 213.

EDUCATIONAL

LEARN electrical engineering the practical way. Our new self-study course includes equipment on which experimental work can be carried out. Also courses for all professional examinations. Free brochure from E.M.I. Institutes, Dept. ER57, London, W.4 (Associated with H.M.V.). 318

CITY & Guilds (Electrical, etc.) on "No Pass —No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 29, Wright's Lane, London, W.8. 100

BOOKS, INSTRUCTIONS, ETC.

"RADIO Interference Suppression: As Applied to Radio and Television Reception." By G. L. Stephens, A.M.I.E.E. An up-to-date guide to the various methods of suppressing electrical interference with radio and television reception. Many practical applications are given, particular attention being paid to the problem of interference at television frequencies. Other chapters deal with the design and choice of suppressor components, methods of locating the source of interference, and suppression at the receiver itself. 10s. 6d. net from all booksellers. By post 11s. 2d. from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. C13

BATTERY CHARGERS AND CHARGING

By Robert A. Harvey, B.SC. (ENG.), M.I.E.E.

This invaluable book shows how the problems of battery charging and control have been solved in many different industries. It enables the engineer to examine the schemes used in other fields and to select and adapt such schemes for his own particular use.

35s. net. *By post 36s. 9d.*

From booksellers or direct from:
Dorset House, Stamford St., London, S.E.1

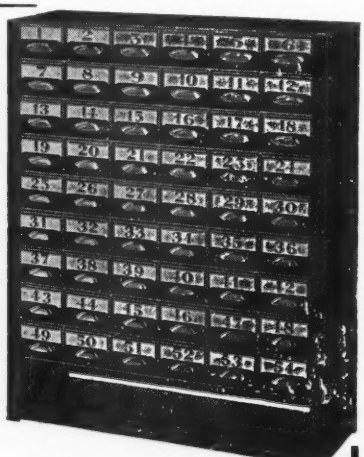
THE **"54"** DRAWER UNIT

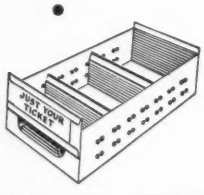
ALL STEEL
Stove Enamelled
BRONZE GREEN

•

OVERALL SIZE
42" HIGH
36" WIDE
12" DEEP

•





Contains 54 of these drawers, each 5" wide, 3" high, 11¼" long. 54 dividers and 54 drawer cards with each unit. Extra dividers 6d. each.

£18

DELIVERED FREE U.K.
SEND FOR SAMPLE DRAWER

N. C. BROWN LTD.

ROCHDALE ROAD WORKS, HEYWOOD, LANCS

Telephone: 69018/9 (3 lines)

The first full-length study of the subject

INDUSTRIAL BRAZING

By H. R. Brooker and E. V. Beatson, B.SC.(ENG.), A.M.I.E.E.

Industrial brazing as a process for metal fabrication has advanced to such an extent that those engaged in the work have found difficulty in keeping pace with its many developments. This book, written by two leading authorities, provides the first full-length study of the subject. It covers all modern brazing methods, including torch, furnace, high-frequency induction, resistance, salt bath and dip, with chapters on the special techniques necessary for aluminium, stainless steels, beryllium copper, cemented carbides and vacuum tube construction.

35s. net. By post 36s. 6d.

Obtainable from booksellers or direct from Iliffe & Sons Ltd. at the address below.

DORSET HOUSE, STAMFORD ST., LONDON, S.E.1

G. A. RIX

KEIGHLEY • ENGLAND

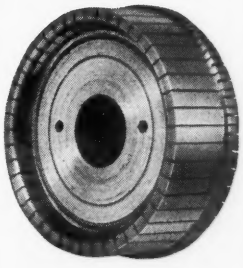
Telephone
2420

Telegrams:
Rix, Keighley

COMMUTATORS

Commutators of all sizes, built to Manufacturers' specifications in large or small quantities.

Other Specialities include
Rebuilding large commutators
Rewinds • Coils
Armatures



for
Motors, Generators and Auto-Electrical Equipment

Let US have your enquiries for
NON-STANDARD ELECTRICAL EQUIPMENT

Instrumentation
Control Panels
Process Controls
Special Contactors
Metalwork, Wiring, Testing
Design and Development

ELECTRODEVICES
Oldham Works, 27 Oldham Road
London, W.10

LADbroke
2688

PORCELAINS
for the Electrical and Allied Trades

GASKELL & GROCOTT LTD.
Whitehall Works, Porthill, Staffs
Telephone: Stoke-on-Trent 84611-3

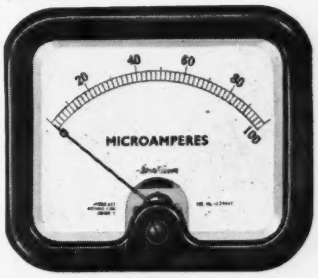
MEASURING INSTRUMENTS
IMMEDIATE DELIVERY

Most Basic Ranges available **ex-stock** for immediate despatch. Special ranges – delivery 7/14 days.

Round, Square or Rectangular patterns available, also full range of Industrial Switchboard Instruments. Portable and Laboratory Instruments, Moving Coil, Moving Iron, Thermo Couple, Electrostatic.

We can supply Meters with Non-Standard Ranges in Current, Volts or Ohms. To B.S. 89. Industrial or Precision Grade accuracy.

Clients are invited to inspect the display of instruments at our New Offices and Showrooms.



Turner Model 605
Rectangular Flush 6" x 5"

Stockists of Meters by Turner, Weston, Baldwin, E.A.C., Weir and other leading manufacturers.

Manufacturers of:
ELECTRONIC TEST EQUIPMENT, NETWORK ANALYSERS, EDUCATIONAL GEOPHYSICAL and SPECIAL INSTRUMENTS, PORTABLE MULTIRANGE TEST SETS at 1 megohm per Volt.

May we quote for your requirements?

ANDERS ELECTRONICS LTD.
103 HAMPSTEAD ROAD, LONDON, N.W.1
Telephone: EUSton 1639

Suppliers to Govt. Depts., B.C.C., Tech. Colleges, Leading Manufacturers & Research Laboratories

Another ALUMINIUM
REFLECTOR
in the
STOCKFIELD
range

★ *Our SP/1 Reflector, spinning in super purity aluminium, electro-brightened to give very high reflectivity.*

Spinners to the Trade

STOCKFIELD MFG. CO. LTD.
23 Stockfield Road
BIRMINGHAM 27

Telephone: Acocks Green 2931

Aero Research Ltd. 38
Airedale Electrical & Mfg. Co. Ltd. 48
Airsonic Ltd. 20
Albion Clay Co. Ltd. 45
Alloy Wire Co. Ltd. 94
Anders Electronics Ltd. 127
Arcolectric Switches Ltd. 30
Ascot Lamps & Lighting Ltd. 101
Ashley Accessories Ltd. 50

Backer Electric Co. Ltd. 104
Barns, W., & Son (Holloway) Ltd. 107
Baume & Co. Ltd. 24
Belling & Lee Ltd. 82
Bill Switchgear Ltd. 3
Birch, H. A., & Co. Ltd. 55
Birkbys Ltd. 95
Bow Slate & Enamel Co. Ltd. 19
Bray, E. N., Ltd. 78
British Insulated Callender's Cables Ltd. ..... 41 & 77
British Switchgear Corporation Ltd. 128
British Thomson-Houston Co. Ltd. 75
Brook Motors Ltd. 23
Brown, N. C., Ltd. 126
Broxlea Products Ltd. 130
Bryce Electric Construction Co. Ltd. 96
Bulgin, A. F., & Co. Ltd. 53
Burdette, A., & Co. Ltd. 72
Burn, Geo., Ltd. 94

Central Electricity Authority 32
Chamberlain & Hookham Ltd. 116
Churchouse, C. M., Ltd. 76
Clarke, H., & Co. (Manchester) Ltd. 24
Colne Switchgear (K & W) Ltd. ... 52
Comoy, H., & Co. Ltd. 107
Cox-Walkers Ltd. 52
Crater Products Ltd. 46
Cressall Mfg. Co. Ltd. 29
Crofts (Engineers) Ltd. 106
Crompton Parkinson Ltd. 21
Cryselco Ltd. 99
Cuxson, Gerrard & Co. Ltd. 130

Daly (Condensers) Ltd. 56
Dorman & Smith Ltd. 57
Dynamo & Electrical Services Ltd. 130

E. I. du Pont de Nemours & Co. (Inc.) 25
Ekco-Ensign Electric Ltd. 109
Electric Depôt Ltd. 29
Electric Elements Co. 59
Electrix Ltd. 52
Electrodevices 127
Ellison, Geo., Ltd. 67
English Electric Co. Ltd. ..... 37 & 81
Enthoven Solders Ltd. 2
Evans, F. W., Ltd. 128
Everett Edgcumbe & Co. Ltd. 70
Ferranti Ltd. ..... 12 & 79
Fitter & Poulton Ltd. 74
Foster Transformers Ltd. 31
Fry's Metal Foundries Ltd. 100

Gambrell Bros. & Co. Ltd. 74
Gaskell & Grocott Ltd. 127
Geipel, W., Ltd. 46
General Electric Co. Ltd. 102
Genristo Ltd. 97
Gent & Co. Ltd. 10
Gilby-Brunton Ltd. 112
Gosheron, John, & Co. Ltd. 108
Greenwood's & Airvac Ventilating Co. Ltd. 43
Grey & Marten Ltd. 64
Guest Keen & Nettlefolds (Midlands) Ltd. 40

H.V.E. (Electric) Ltd. 112
Hackbridge & Hewittic Electric Co. Ltd. 110
Harvey, G. A., & Co. (London) Ltd. 19
Hawke Cable Glands Ltd. 76
Headland Engineering Developments Ltd. 129
Heatrae Ltd. 1
Henley's, W. T., Telegraph Works Co. Ltd. 83
Hirst Electronic Ltd. 129
Hoffmann Mfg. Co. Ltd. 49
Hyde, J. B., & Co. Ltd. 112

I.A.C. Ltd. 51
Igranic Electric Co. Ltd. 36
Imperial Chemical Industries Ltd. 9, 87 & 92
International Combustion Ltd. 42

Jackson Electric Stove Co. Ltd. ... 17
Johnson, Matthey & Co. Ltd. 44
Johnson & Phillips Ltd. 39

King, Geo. W., Ltd. 15
Klöckner Moeller England Ltd. ... 62
Laurence, Scott & Electromotors Ltd. 35
Lee & Wilkes Ltd. 114
Lindsay & Williams Ltd. 97
Litholite Insulators & St. Albans Mouldings Ltd. 59
Liverpool Electric Cable Co. Ltd. 51
Logan, W., & Co. Ltd. 112
Lumitron Ltd. 52
Lundegard Hardwood Co. Ltd. ... 76

M.T.E. Control Gear Ltd. 18
Maclaren, R., & Co. Ltd. 93
Martindale Electric Co. Ltd. 54
Metropolitan-Vickers Electrical Co. Ltd. ..... Cover 4 & 88
Micafil Ltd. 90
Micanite & Insulators Co. Ltd. 80
Midland Electric Mfg. Co. Ltd. ... 4
Midland Silicones Ltd. 22
Monmer Foundry Ltd. 130
Morgan Crucible Co. Ltd. 89
"Motor Transport" 114

Nalder Bros. & Thompson Ltd. ... 105
Neo Electrical Industries Ltd. 130
Nettle Accessories Ltd. 14
Newton Bros. (Derby) Ltd. 98

Ormond Engineering Co. Ltd. 28
Otter Controls Ltd. 30
Ottermill Switchgear Ltd. 71

P. & B. Engineering Co. Ltd. 58
Painter Bros. Ltd. ..... Cover 2
Painton & Co. Ltd. 27
Parsons, C. A., & Co. Ltd. 115
Partridge, Wilson & Co. Ltd. 7
Parvalux Ltd. 129
Paxtons (Electrical) Ltd. 29
Pearce, A. (Birmingham) Ltd. 74
Permali Ltd. 34
Philips Electrical Ltd. 61
Pitman, Sir Isaac, & Sons Ltd. 107
Plessey Co. Ltd. 68
Pope's Electric Lamp Co. Ltd. 6
Power Centre Co. Ltd. 5
Pratt, A. J., & Sons Ltd. 64

Quicksilver Tube Mfg. Co. 128

Ratcliff, J. F. (Metals) Ltd. 23
Record Electrical Co. Ltd. 91
Renold Chains Ltd. 63
Revo Electric Co. Ltd. 65
Rich & Pattison (Birmingham) Ltd. 55
Richardsons Westgarth & Co. Ltd. 11
Rix, G. A. 127
Robinson, D., & Co. 114
Robinson, L., & Co. Ltd. 93
Rowlands Electrical Accessories Ltd. 23
Runbaken Electrical Products 94
Russell Auto-Feed Screwdrivers Ltd. 104
Ryman, F., Electrical Ltd. 130

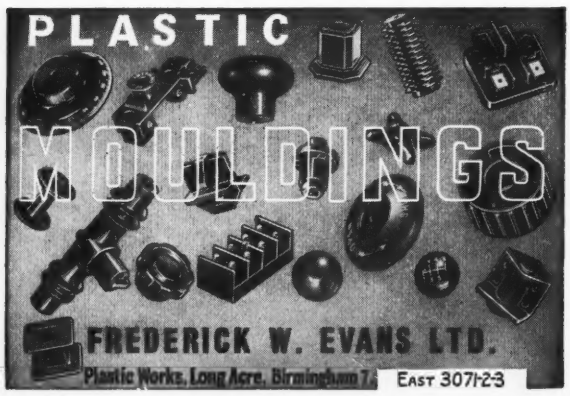
Salter, Geo., & Co. Ltd. 86
Santon Ltd. 8
Sax, Julius, & Co. Ltd. 29
Shell-Mex & B.P. Ltd. 20
Siemens Edison Swan Ltd. Cover 1 & 103
Simmonds & Stokes (Niphan) Ltd... 104
Simplex Electric Co. Ltd. ..... 84 & 85
Sims, F. D., Ltd. 55
Smiths Industrial Instruments Ltd. 13
Sperryn & Co. Ltd. 16
Square D, Ltd. ..... Cover 3
Standard Telephones & Cables Ltd. 111
Stockfield Manufacturing Co. Ltd... 127
Stream-Line Filters Ltd. 47

Taylor, Armand, & Co. Ltd. 16
Temple Tubes 33
Terry, Herbert, & Sons Ltd. 26
Thompson Bros. (Engineers) Ltd... 64
Transformer & Electrical Co. Ltd. 93
Transformers & Rectifiers Ltd. 49
Trumeter Co. Ltd. 64
Tudor Accumulator Co. Ltd. 73
Tungstone Products Ltd. 98

Universal Electrical Co. 76

Veritys Ltd. 66
Victor Products (Wallsend) Ltd. ... 59
Vincent Switchgear Mfg. Co. Ltd. 94
Volex Electrical Products Ltd. 60

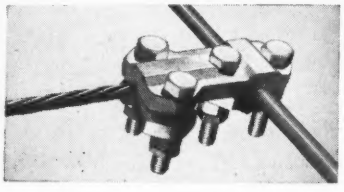
Wades (Halifax) Ltd. 56
Walter, Austin, & Son Ltd. 51
Wandleside Cable Works Ltd. 114
Wellings, Male & Co. Ltd. 51
Western Diecasting Ltd. 46
Westinghouse Brake & Signal Co. Ltd. 113
Westminster Engineering Co. Ltd... 64
Woden Transformer Co. Ltd. 45
Wootton & Co. Ltd. 63



ADVERTISEMENT BLOCKS

Will advertisers on whose behalf we still hold blocks last used between **7th January, 1955 and 30th December, 1955** please advise us by the 1st January, 1958 if they wish them to be returned

Unwanted blocks will be destroyed



Solderless UNIVERSAL CONNECTORS

FOR ALL CONNECTIONS AND TYPES OF CONDUCTORS

BRITISH SWITCHGEAR CORPORATION LTD.

MAKERS OF H.T. SWITCHGEAR

Morden Factory Estate, London, S.W.19

LIB 2273-5

have you a **SWITCHING** *problem?*

then consult us for all types of

MERCURY SWITCHES

We offer completely reliable Switches coupled with good delivery

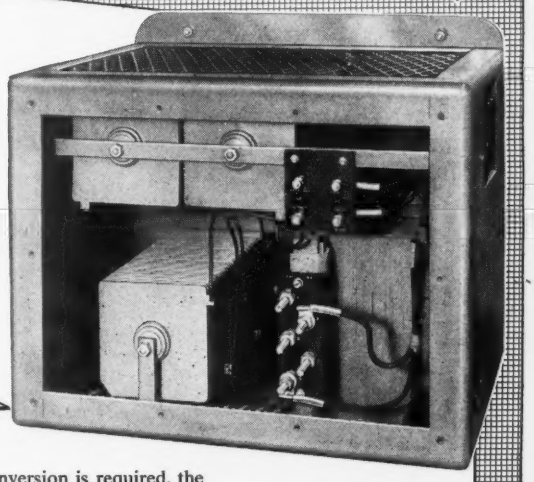
Write for catalogue

QUICKSILVER TUBE MNFG. CO.

WILLOW ROAD, COLNBROOK, BUCKS. **Tel. Colnbrook 382**

HED LTD

RECTIFIERS



OTHER H.E.D. PRODUCTS

- *Precision Welding Equipment*
- *Welding Controls*
- *High Speed Contactors*
- *Saturable Reactors*
- *Transformers*
- *Coil Winding*
- *Magnetizing Equipment*
- *Air-conditioned Welding and Assembly Benches*

Where AC to DC conversion is required, the Rectifiers manufactured by HED have been in use for many years and installations up to 100 kilowatts have been manufactured. These can be supplied as straight Transformer Rectifiers or with Magnetic Amplifier Control giving smooth DC Control outputs over a very wide range. Air Blast or Oil Filled can be supplied depending upon the application and use.

HIRST ELECTRONIC LTD • GATWICK ROAD, CRAWLEY, SUSSEX • CRAWLEY 2166

We specialise in

FHP *Motors*

Including Universal, Permanent Capacitor, Induction, Synchronous, Shaded Pole and Split Phase types. These motors are available with Single or Double Reduction Worm Gear Boxes, with a range of speeds from ¼ r.p.m. up to 840 r.p.m. Our latest catalogue available on request.

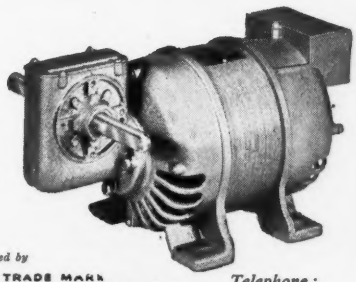


Illustration shows Parvalux S.D.19 Single Reduction Worm Gear Unit with Split Phase Induction motor. 1/8 h.p. with a range of final speeds from 20 to 690 r.p.m.

Designed and Manufactured by

REGD. TRADE MARK

PARVALUX

LIMITED

Telephone: Parkstone 3827 PBX

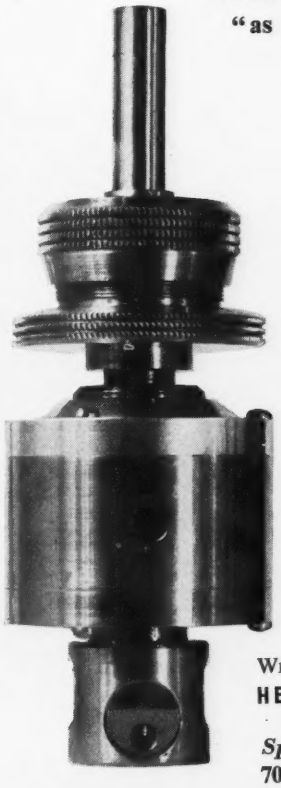
Telegrams: Parvalux, Parkstone

PARKSTONE · POOLE · DORSET · ENGLAND

DHB/2919A

THREADS . . .

"as perfect as the tap used"



PLASTICS AND NON FERROUS METALS

Expeditiously tapped with

THE "HED" TAPPING ATTACHMENT

Weight 24 oz.

Write for details to:

HEADLAND ENGINEERING DEVELOPMENTS LTD

Special Tools Division

70 Burley Road, Leeds 3

The DYNO-SIREN

FIRE ALARM OR WARNING SYSTEM

TYPE A
HIGH FREQUENCY NOTE

TYPE B
ULTRA HIGH FREQUENCY NOTE

AC/DC ANY VOLTAGE

TOTALLY ENCLOSED BALL BEARINGS

6⅜" HIGH x 3¾" DIAMETER

£7 - 7 - 0 RETAIL

Send for leaflet

DYNAMO & ELECTRICAL SERVICES LTD.

UNITY WORKS
PEARSON STREET
BLACKBURN, LANCS

Phone: BLACKBURN 44458/9/50

INDUSTRIAL FIRST AID

For 60 years we have specialised in the First Aid requirements of Industry.

Our service is most comprehensive; whether you require a completely equipped ambulance room for a vast factory, or a first aid box for a "one man" works, we shall be pleased to advise and supply you.

A PRODUCT OF
Cuxson, Gerrard & Co. Ltd.
OLDBURY BIRMINGHAM

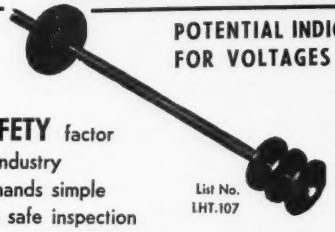
Pioneers of Industrial First Aid

BROXLEA PRODUCTS LIMITED

Park Lane, Broxbourne, Herts. *Phone: Hoddesdon 3091/2*

specialists in
CABLE FORMING
to the Electronic and Communications Industries

neo - MAINTEST



POTENTIAL INDICATORS FOR VOLTAGES UP TO **33 kV**

SAFETY factor in Industry demands simple and safe inspection

List No. LHT.107

Designed for vertical and horizontal isolation switchgear
COLLIERIES
SUPPLY AUTHORITIES
INDUSTRIAL CONSUMERS

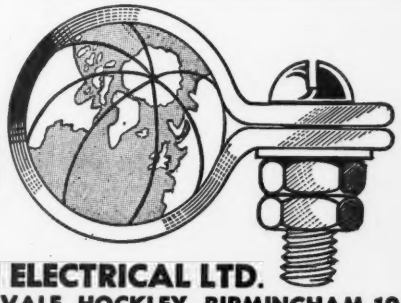
NEO ELECTRICAL INDUSTRIES LTD.
MANCHESTER 4

USE
MONMER
GREY IRON CASTINGS

for speedy and economical production

Send us your enquiries
MONMER FOUNDRY LTD.
ST. ANNES ROAD, WILLENHALL, STAFFS
Telephone: Willenhall 62

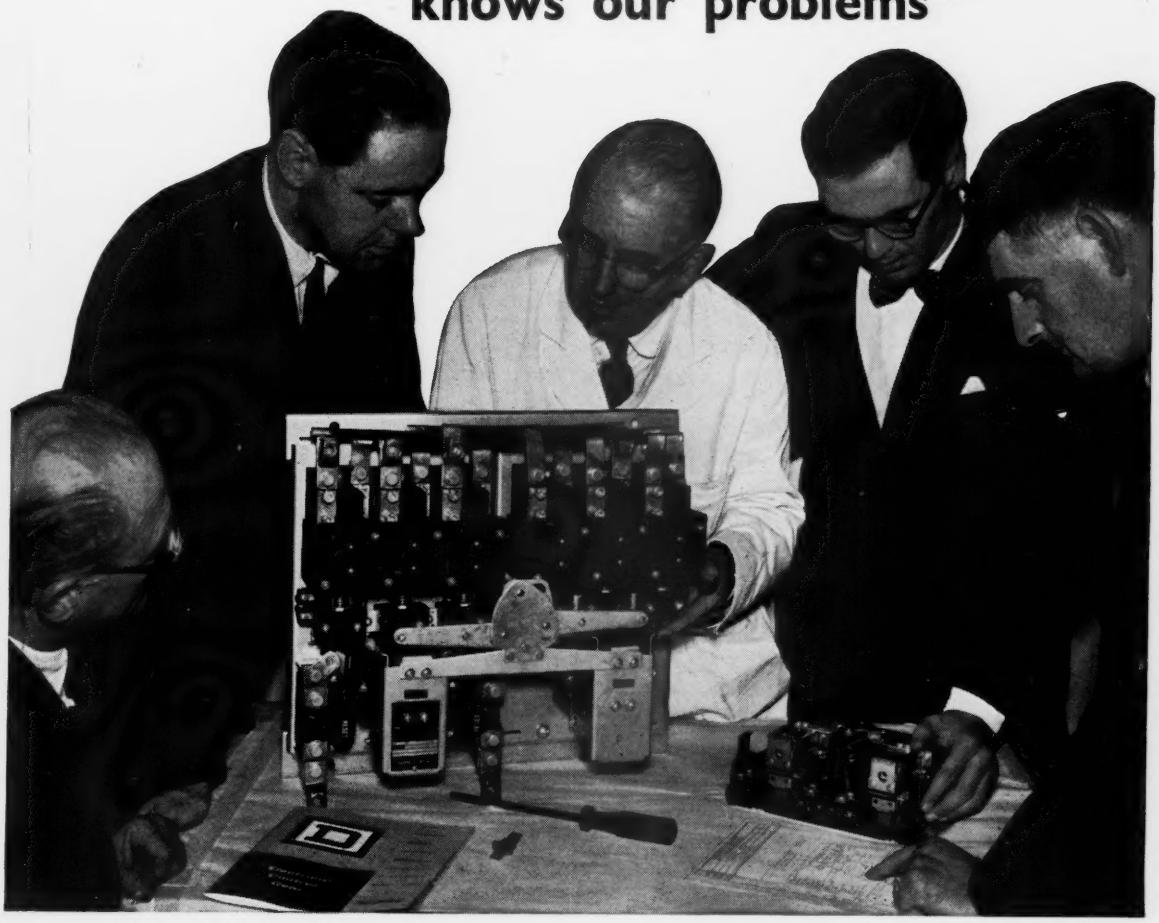
THE
GOOD EARTH
BY



F. RYMAN ELECTRICAL LTD.
72 HUNTERS VALE, HOCKLEY, BIRMINGHAM 19
Phone: NOR 2403
MANUFACTURERS OF EARTHING CLIPS (ALL TYPES)
CABLE SOCKETS, COPPER CLAMP WASHERS
QUALITY PRODUCTS ONLY

Published by ELECTRICAL REVIEW PUBLICATIONS LTD., at Dorset House, Stamford Street, London, S.E.1
and printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants.

"The man who designed these starters knows our problems"



"Very compact for 100 H.P." *"All front wired"*

"Excellent mechanical interlock" *"We could save space with these"*

"Similar design from smallest to largest" *"Extra auxiliary switches easily added"*

"We'd better change to Square D"

Class 8736 A.C. Reversing Magnetic Starters

FIELD OFFICES—LONDON · BIRMINGHAM · MANCHESTER & GLASGOW

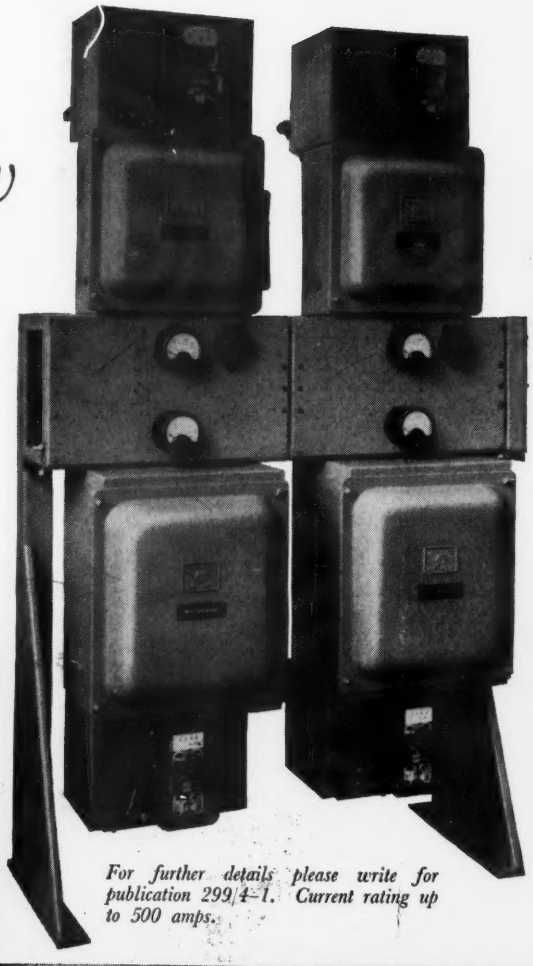
SQUARE D LIMITED

100 ALDERSGATE STREET, LONDON, E.C.1 Telephone: METropolitan 8646

SD19

This unit will grow

Metrovick Type MC distribution switchboards are easily and quickly installed, boards being built up on site from stocked components, and can be extended without limit to the number of circuits. One of the features of these switchboards is the unit construction of the busbar chambers, which are made to suit the several sizes of fuse-switch.



For further details please write for publication 299/4–1. Current rating up to 500 amps.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

LEADING SWITCHGEAR PROGRESS

F/A 709